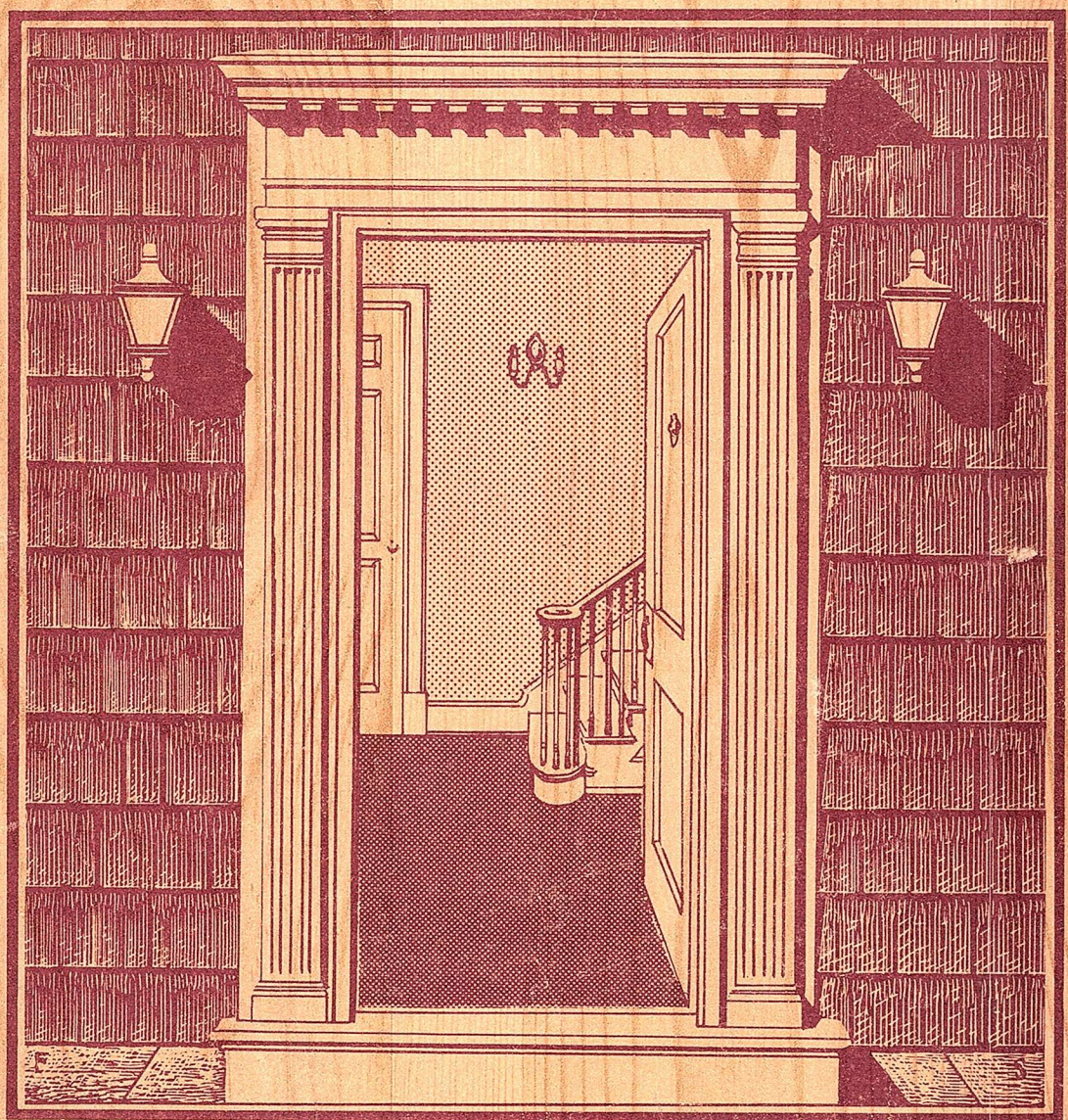
Suggested Unit Course
IN
INTERIOR and EXTERIOR TRIM



DELMAR PUBLISHERS, Inc.
Albany, New York

Suggested Unit Course in

INTERIOR AND EXTERIOR TRIM

Carpentry Series

DELMAR PUBLISHERS, Inc.
Albany, New York

CARPENTRY SERIES

The carpentry series includes five well-illustrated modern texts designed for carpentry students, apprentices, home workshop hobbyists, home owners, craftsmen, construction foremen, and teachers.

The text material is arranged in the order in which the related trade theory units are learned and fundamental carpentry operations performed in the erection of light frame buildings.

HAND TOOLS AND PORTABLE MACHINERY

A beginner's text on the theory and use of hand, measuring, layout, cutting tools, and portable carpentry machines.

192 pages (7¾x10¼); 390 illustrations

CONCRETE FORM CONSTRUCTION

An elementary text covering the layout and construction of differently shaped concrete forms for frame buildings.

106 pages (7¾x10¼); 127 line drawings

FRAMING, SHEATHING AND INSULATION

A basic as well as reference text on sill, girder, and floor framing; side walls; roof and special framing practices; and insulation.

237 pages (7¾x10¼); 220 line drawings

INTERIOR AND EXTERIOR TRIM

A basic text on the theory and processes common to exterior and interior trim work for frame buildings; contains many practical suggestions for home construction.

264 pages (7¾x10¼); 260 line drawings

SIMPLIFIED STAIR LAYOUT

by J. Douglas Wilson and S. O. Werner

This basic text gives all the related technical information needed to lay out and frame the stair horses and well hole for straight and platform stairs. PART A covers: stairway types, parts, and construction; mathematical terms; and fundamental principles of stair layout work. Mathematical calculations for stair building and step-by-step layout procedures are treated in PART B.

57 pages + v pp. (7¾ x 10¼); 34 line drawings

PREFACE

Increased demands for industrial and domestic building construction, and the shortage of skilled carpenters, has created a need for well organized instructional material for industrial-technical training programs. In addition, with the lifting of restrictions on the procurement of building materials, many home owners are confronted with the problem of performing basic woodworking operations for the upkeep and maintenance of personal property.

Careful analyses were made over a period of years to determine what the essential occupational areas of the carpentry field include. As a result, four main divisions of the trade were defined and texts were prepared to cover: (1) Hand Tools and Portable Machinery; (2) Concrete Form Construction; (3) Framing, Sheathing and Insulation; and (4) Interior and Exterior Trim.

The selected instructional units in each of the four texts include only basic and fundamental operations common to a specific branch of carpentry work. Further study revealed that each operation involves the teaching of basic trade theory and fundamental processes. In accordance with this line of reasoning, a *Trade Theory Series* and an accompanying *Fundamental Process Series* of instructional units are included in each book.

Trade Theory Series

Related technical information such as principles governing carpentry practices, computations, and descriptions of tools and materials are covered in the *Trade Theory Series*. This technical information also serves as a reference for the student by supplying him with the trade knowledge necessary to perform carpentry operations skillfully.

Fundamental Process Series

Each step involved in the actual performance of an operation that requires the use of hand tools, measuring tools or portable machinery is fully described in common trade terminology and well illustrated with line drawings in the *Fundamental Process Series*. The term *Fundamental Process* is used because the processes which constitute an operation are common to carpentry work in any situation. The *Fundamental Process* units serve as reference material for the actual performance of operations and may be used to supplement the teaching of operations whether they be on the job or in a school or industrial shop.

The instructional units appear in the sequence generally followed in erecting light frame buildings. Under actual training conditions the order may be changed to meet exacting course requirements for a locality without affecting the efficiency of the material.

* * * *

Grateful acknowledgment is made to the Bureau of Industrial and Technical Education, The New York State Education Department, for permission to reprint this instructional material.

The Editor

Albany, New York
August, 1946

Carpentry Series

INTERIOR AND EXTERIOR TRIM

TABLE OF CONTENTS

Part I. EXTERIOR TRIM

Units of Instruction

Trade Theory Series		*Fundamental Process Series*	
Unit	*Pages*	*Unit*	*Pages*
1C-T57 Description of Common Types of Cornices	1 to 7	1C-P57 How to Build Common Types of Cornices	8 to 21
1C-T58 Description of Wood Shingles	22 to 27	1C-P58 How to Lay Wood Shingles	28 to 40
1C-T59 Description of Composition Roof Covering	41 to 43	1C-P59 How to Apply Composition Roofing	44 to 52
1C-T60 Description of Window Frames	53 to 60	1C-P60 How to Build Window Frames	61 to 67
1C-T61 Description of Pre-Fabricated Frames	68 to 70	1C-P61 How to Assemble and Install Window Frames	71 to 74
1C-T62 Types of Door Frames	75 to 76	1C-P62 How to Build and Install Door Frames	77
1C-T63 Description of Water Tables, Cornerboards and Belt Courses	78 to 80	1C-P63 How to Apply Water Tables, Cornerboards and Belt Courses	81 to 84
1C-T64 Description of Exterior Side Wall Coverings	85 to 87	1C-P64 How to Apply Exterior Side Wall Coverings	88 to 95
1C-T65 Types of Porch Trim	96 to 100	1C-P65 How to Apply Porch Trim	101 to 111
1C-T66 Description of Front Entrances	112 to 113	1C-P66 How to Build Front Entrances	114 to 116

Part II. INTERIOR TRIM

1C-T67 Methods of Hanging Window Sash	117 to 120	1C-P67 How to Fit Window Sash	121 to 126
1C-T68 Description of Lath and Plaster Bases	127 to 128	1C-P68 How to Install Plaster Bases	129 to 130
1C-T69 Description of Wall Boards	131 to 132	1C-P69 How to Apply Wall Boards	133 to 137

Trade Theory Series

Unit		*Pages*
1C-T70	Description of Interior Door Jambs	138 to 139
1C-T71	Types of Door Trim	144 to 146
1C-T72	Description of Window Trim	153 to 154
1C-T73	Types of Baseboards	159 to 161
1C-T74	Description of Wall Panel and Ceiling Trim	166 to 168
1C-T75	Description of Kitchen Cabinets	172 to 174
1C-T76	Description of Clothes and Linen Closets	187 to 189
1C-T77	Description of Bookcases and Mantel Shelves	192 to 193
1C-T78	Description of Finish Stairs Built on Carriages	200 to 203
1C-T79	Description of Stairs Built With Housed Stringers	209 to 211
1C-T80	Description of Stairs with Housed and Open Stringers	219 to 220
1C-T81	Description of Newel Posts and Hand Rails	225 to 232
1C-T82	Description of Finished Floors	237 to 238
1C-T83	Description of Interior and Exterior Doors	244 to 246
1C-T84	Description of Finish Hardware	250 to 254

Fundamental Process Series

Unit		*Pages*
1C-P70	How to Build and Install Door Jambs and Bucks	140 to 143
1C-P71	How to Fit and Install Door Casings	147 to 152
1C-P72	How to Fit and Apply Window Trim	155 to 158
1C-P73	How to Install Baseboards	162 to 165
1C-P74	How to Install Ceiling and Wall Trim	169 to 171
1C-P75	How to Build and Install a Kitchen Cabinet	175 to 186
1C-P76	How to Build Interiors of Clothes and Linen Closets	190 to 191
1C-P77	How to Build a Recessed Niche, Corner Cabinet and Mantel Shelf	194 to 199
1C-P78	How to Build Finish Stairs on Carriages	204 to 208
1C-P79	How to Make Housed Stringers and Assemble Stairs	212 to 218
1C-P80	How to Build Stairs with Housed and Open Stringers	221 to 224
1C-P81	How to Fit Newel Posts and Hand Rails to Stairs	233 to 236
1C-P82	How to Lay Finish Floors	239 to 243
1C-P83	How to Fit a Door	247 to 249
1C-P84	How to Apply Finish Hardware	255 to 263

Bibliography 264

Part I

Units of Instruction in

EXTERIOR TRIM

INTERIOR AND EXTERIOR TRIM — Part I

DESCRIPTION OF COMMON TYPES OF CORNICES

OBJECTIVES OF THE UNIT

1. To define a cornice and its functions.
2. To describe the common types of cornices.
3. To describe the wood members used in cornice construction.

INTRODUCTORY INFORMATION

The design and types of corncies depend in most cases upon the architectural style of the building. Because of this, there is no standard type of cornice that may be used as a model. Cornices may be classified into two main divisions. The open cornice consists of exposed rafter tails and the closed type has the rafter tails enclosed. These two main divisions may be further subdivided into many sizes and shapes according to the cost, number of members, and decorative features.

DEFINITION AND FUNCTIONS OF A CORNICE

The cornice of a building is that section where the lower edge of the roof meets the wall line. This section is also referred to as the eaves and is built up of several plain or moulded members (A, Fig. 1).

In some cases the cornice is continuous around the building. It may also extend along only two sides of the building and be returned a short distance around the ends of the building. This is called a return cornice (B, Fig.1).

The cornice may also be extended up the slope of the roof at the intersection of the wall and the roof line. This section is called the rake cornice (C, Fig. 1).

A cornice is also required on the dormer of Fig. 1 and may be called

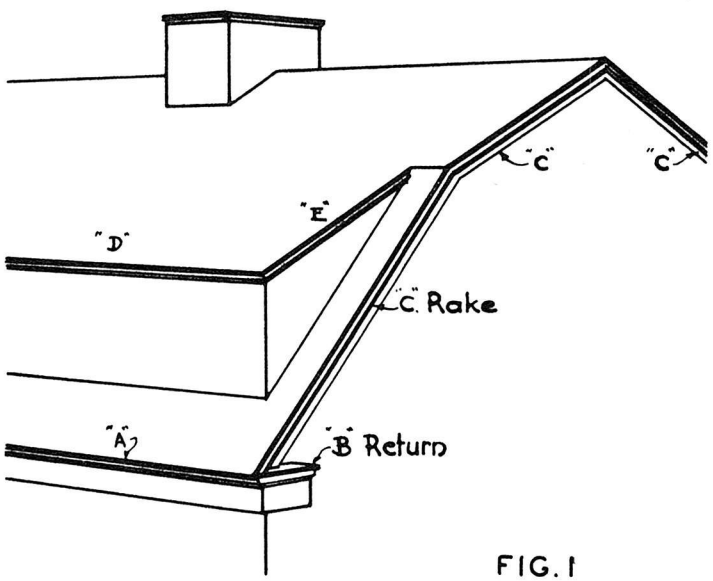


FIG. 1

POSITION AND KIND OF CORNICE

the dormer horizontal cornice as at D, Fig. 1 and the dormer rake cornice as at E, Fig. 1.

A cornice provides a means of decorating the section where the roof and walls of a building meet. The cornice is often used to carry out the roof lines so that they are in keeping with the general style of the building. A projecting cornice protects the wall of the building by shedding water away from the wall surface, and by providing a surface upon which gutters may be installed to carry the drainage to a downspout.

DESCRIPTION OF CORNICE MATERIALS

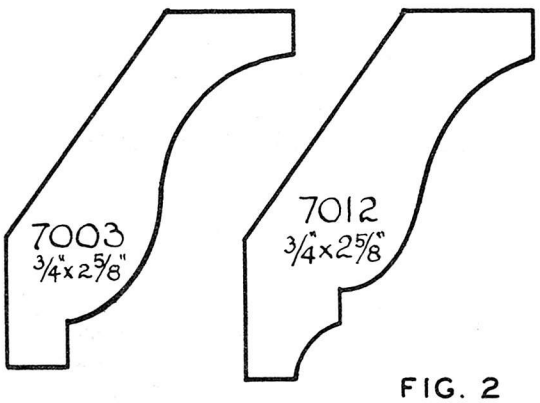


FIG. 2

CROWN MOULDINGS

Mouldings are narrow strips of wood, fashioned to present a depressed or extended surface. They are used for decorating flat surfaces and for internal and external corners. Although there are a large number of mouldings, only the common types will be considered here. These mouldings are standardized as to shape and dimensions and each has an identifying number which makes possible the perfect matching of mouldings in repair work. It also simplifies the grouping of mouldings so as to carry out desirable architectural lines in cornice construction.

A. Crown mouldings are manufactured in two general shapes. This type of moulding is generally used on a cornice at the fascia and roof line. One size is shown in Fig. 2. The dimensions are taken along the major and minor axes of the moulding. The numbers are symbols for the identification of the moulding when ordering

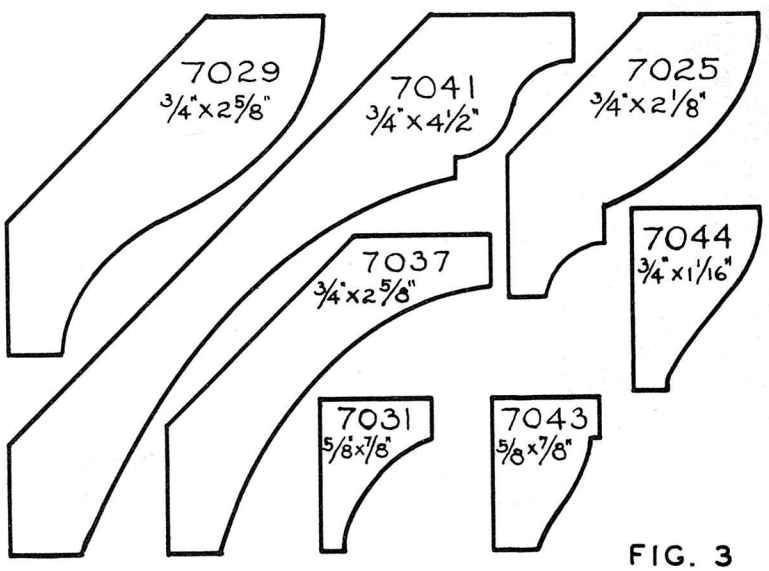


FIG. 3

BED AND COVE MOULDINGS

standardized stock. Standard sizes of crown moulding along the major axis run from 1 5/8 in. to 4 1/2 in.

B. Bed and cove mouldings are sometimes used instead of, or in combination with crown mouldings. Examples of several shapes and sizes are shown in Fig. 3. They are identified and dimensioned the same as the crown mouldings. Additional sizes are available. Examples of many other types of mouldings used in cornice work may be found in the references listed on the last page of this unit.

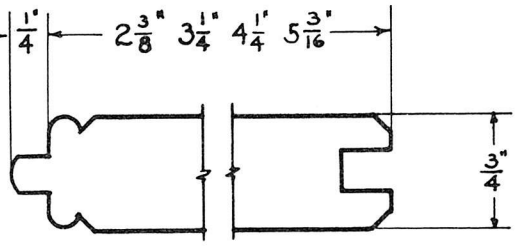


FIG. 4 BEADED CEILING

ALL THICKNESSES APPLY TO ALL WIDTHS ALL WIDTHS APPLY TO ALL THICKNESSES	
NOMINAL SIZE	DRESSED SIZE.
THICKNESS	THICKNESS
1"	25/32"
1¼"	1 1/16"
1½"	1 3/16"
WIDTHS	WIDTHS
3"	2 5/8"
4"	3 5/8"
5"	4 5/8"
6"	5 5/8"
7"	6 5/8"
8"	7 ½"
9"	8 ½"
10"	9 ½"
11"	10 ½"
12"	11 ½"

FIG. 5 COMMON BOARDS

C. Edge beaded ceiling is generally used on open cornices. It is manufactured in many thicknesses and widths. See Fig. 4.

D. Other members are generally standard dressed stock. The minimum thicknesses and widths of finished common lumber are shown in the table in Fig. 5.

OPEN CORNICES

Fig. 6 shows a section of an open cornice. The lookout rafters are made of dressed stock, generally the size of the common rafter. They should extend approximately the same distance above the plate that they project beyond the building line so that they may be firmly spiked to the sides of the common rafters. The part of the lookout rafter that is exposed to view is, in most cases, cut to some ornamental curve at the bottom and to a plumb cut at its end so as to provide a surface on which a hanging gutter may be attached. A fascia board is sometimes nailed to the plumb cut of the rafters to form a solid base for the gutter.

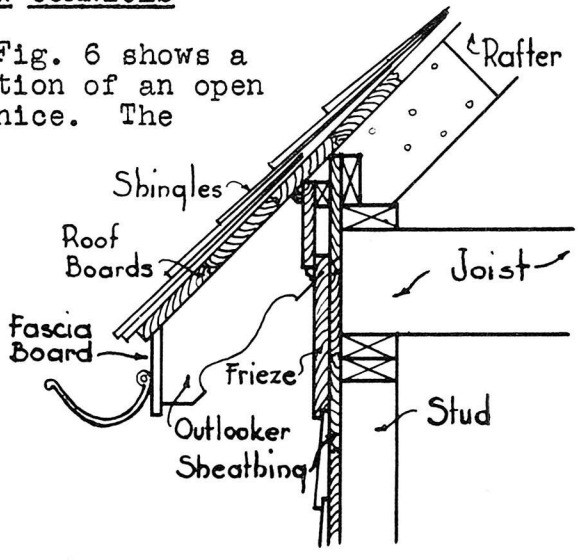


FIG. 6 OPEN CORNICE

The lookout rafters sometimes extend beyond the building as much as 3 ft. and are supported by being spiked to the sides of the common rafters. The roof boards nailed to the top of the exposed lookout rafters are generally dressed beaded ceiling stock of the same thickness as the rough roof boards of the upper roof surfaces. This provides a finished appearance to the under side of the cornice between the rafters.

A wide frieze board is placed as shown in Fig. 6. A narrower frieze board extends from the top of the wide frieze up to the bottom of the roof boards between the lookout rafters. A moulding may be placed at the joint of these two frieze boards. A moulding would also be placed between the upper frieze and the roof boards.

The lookout rafters are sometimes fastened to the common rafters in such a way as to form a sweep to the roof at the cornice (Fig. 7). This is done where the bottom end of the lookout rafter would be too low if it were continued in the same plane as the common rafter of the building. It also gives the roof a pleasing appearance and adds a low broad effect of the building.

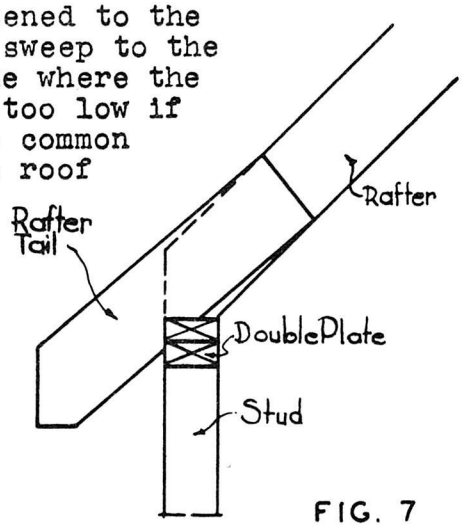


FIG. 7

CORNICE WITH SWEEP

In buildings that are not insulated, the heat that escapes through the roof above the wall line in the winter months melts the snow. The water then drains from the roof surface until it reaches the section of the roof beyond the building line. This outer section of the roof is exposed on the underside to cold winds. This causes the draining water to freeze on this surface and in the hanging gutter. The accumulating ice at this section of the roof causes the water to back up underneath the shingles to a point above the building line where it seeps into the building, causing serious trouble. This decided disadvantage of the large overhanging open cornice together with the extra labor of installation and the costly upkeep have tended to make this type of open cornice obsolete, especially in the northern part of the United States.

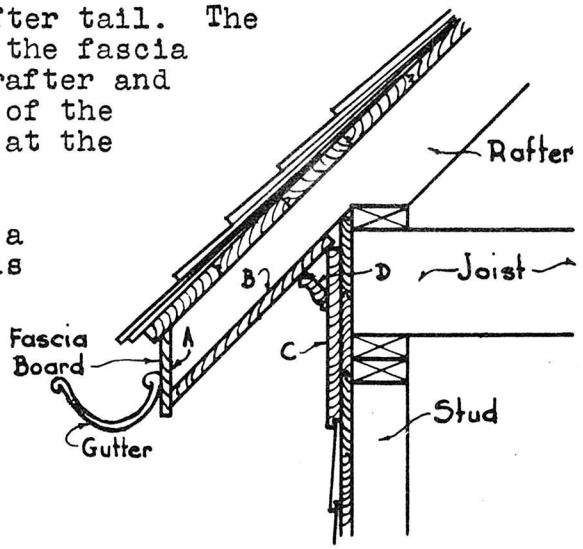
When the roof is well insulated the heat of the building does not escape to such an extent as to melt the snow on the upper part of the roof and this trouble caused by the exposed section of the roof is not serious.

BOX OR CLOSED CORNICES

Figure 8 shows one type of closed or box cornice. This type is built on the extended common rafters. The fascia (A) is nailed

to the plumb cut at the end of the rafter tail. The plancier (B) is fitted to the back of the fascia and nailed to the bottom edge of the rafter and extends up the rafter to the top edge of the frieze (C). A moulding (D) is fitted at the intersection to cover the joint.

Figure 9 shows a box cornice with a level plancier. This type of cornice is similar to that in Fig. 8 except that horizontal brackets are nailed from the tips of the tail rafters to the wall of the building. These brackets form nailing surfaces and support for the fascia and plancier. The plancier may be of any width and is generally made up of matched ceiling boards if wider than 11 in. or of one board if narrower.

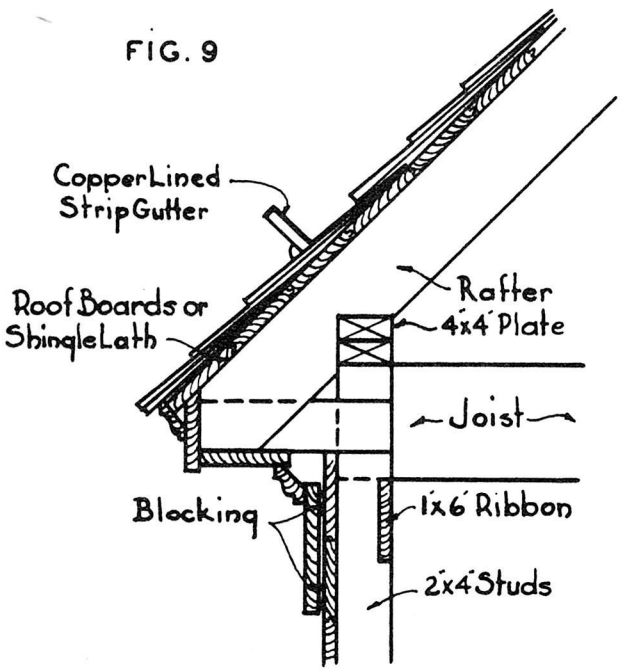


CLOSED CORNICE WITH SLOPING PLANCIER

FIG. 8

If a hanging gutter such as shown in Fig. 8 is to be used, the fascia is generally about 6 in. wide. This will provide firm support for the entire length of the gutter which has to be pitched to a low point to drain the water into the downspout or leader box. The gutter material may be of metal or wood and is often shaped on the exposed surface to represent the contour of a crown moulding. A strip gutter may also be used as shown in Fig. 9. A built-in or sunken gutter is also often used.

FIG. 9

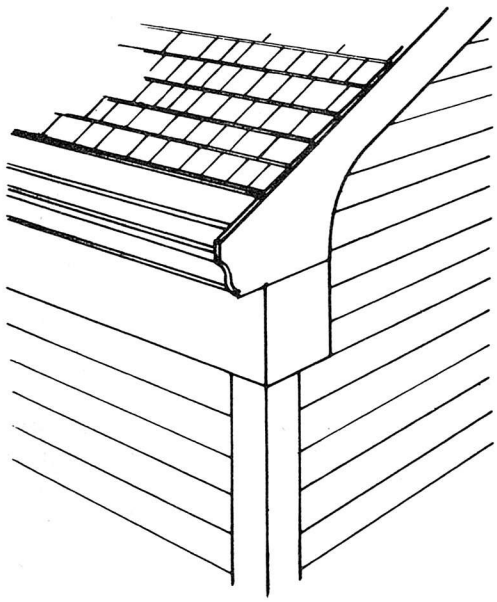


BOX CORNICE

Figure 10 shows a built-in or sunken gutter and how it appears in relation to the cornice and roof surface. An advantage of this type of gutter is that the tendency of the water to back up under the shingles is reduced to a minimum. Another advantage is that the gutter does not detract from the appearance of the roof because it is not noticed from the ground.

Still another advantage is that it presents a straight appearance from the outside. The pitch required for the drainage of the gutter to the downspout is provided by sloping the bottom board from a high point to a low point.

The strip gutter as shown in Fig. 9 requires less labor and material but the slope required to drain the water presents an unsightly

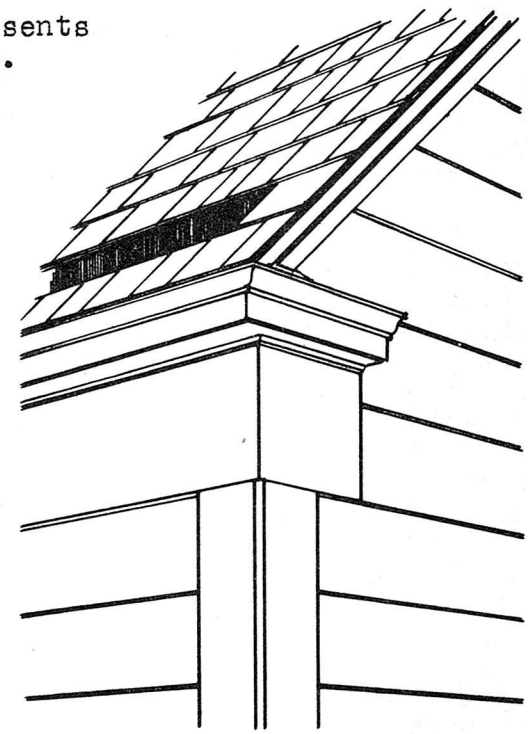


SNUB CORNICE WITHOUT A RETURN

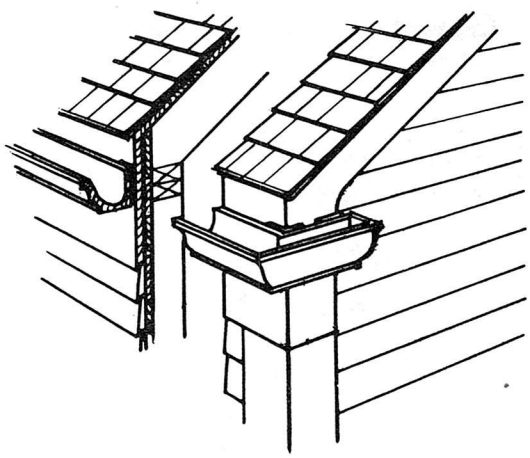
FIG. 11

appearance. The uneven spacing of the courses of shingles to compensate for the high and low points of the gutter strip also mars the appearance of the roof.

A simpler type of cornice used on modern homes is shown in Fig. 11. This is sometimes referred to as a snub cornice. It consists of a metal or wood gutter, the outside surface



BOX CORNICE
WITH BUILT-IN GUTTER
FIG. 10



SNUB CORNICE WITH RETURN

FIG. 12

of which is formed or moulded to represent a large crown mould. The moulded wood gutter is sometimes lined with metal or it may be made of a wood that is resistant to moisture such as cypress or beech. The absence of the fascia and plancier in this type of cornice gives it a simplicity of construction and design.

Figure 12 shows another method of finishing the gutter at the rake so that it will represent a return of the cornice.

RETURN CORNICE

The return of a cornice (B, Fig. 1) is used where the cornice is terminated, such as at the ends of the side walls, or where a gable is located at the side wall and the cornice does not extend across the gable.

The principle of forming a return of any cornice or moulding is that its profile should be projected from one surface to another. This principle is followed in returning the individual cornice members around the corner of the building as shown at B, Fig. 1. Notice that the plancier, fascia, and crown moulding project beyond the building line the same distance on the end of the building as they do on the side. The same general procedure is followed in forming the rake cornice which extends along the slope of the roof as shown at C, Fig. 1. In the colonial cornice, this return is snubbed as it returns around the corner of the building. This practice avoids a large overhang of the rake cornice.

In some cases where the open cornice returns up the rake, the frieze board extends from the horizontal frieze board up the rake of the roof. The return of the horizontal fascia extends beyond the end of the building up the rake of the roof. This board is sometimes increased in thickness and width and provides a surface upon which the horizontal crown moulding is extended up the rake to the peak of the roof. In this case it is called a bargeboard.

SELECTED REFERENCES

Audels Carpenters and Builders Guide # 4 ..... Graham and Emery

Carpentry ..... Townsend

American Lumber Standards for Softwood Lumber .... Dept. of Commerce

Carpentry and Joinery Work ..... Burbank

Architectural Graphic Standards ..... Ramsey and Sleeper

HOW TO BUILD COMMON TYPES OF CORNICES

OBJECTIVES OF THE UNIT

1. To show how to build common types of open cornices.
2. To show how to build common types of closed cornices.
3. To show how to install gutters on cornices.
4. To show how to build return and rake cornices.
5. To show how to build a snub cornice.

INTRODUCTORY INFORMATION

In most cases the cornice is the first exterior trim to be installed on a frame house. This is because the cornice is more conveniently installed before the roof covering is placed.

The fundamental operations described in this unit should give the learner a broad knowledge that he can apply to any one of the many styles of cornices.

TOOLS AND EQUIPMENT

Chalk line
Spirit level
Steel square
Pencil
Hammer - Nail set
Crosscut saw (10 point)
Miter box
Block plane

PROCEDURE

HOW TO BUILD AN OPEN CORNICE

NOTE: Figure 1 shows an open cornice. It is assumed that the common rafters are in place and that the cornice is to extend along a straight side of the building.

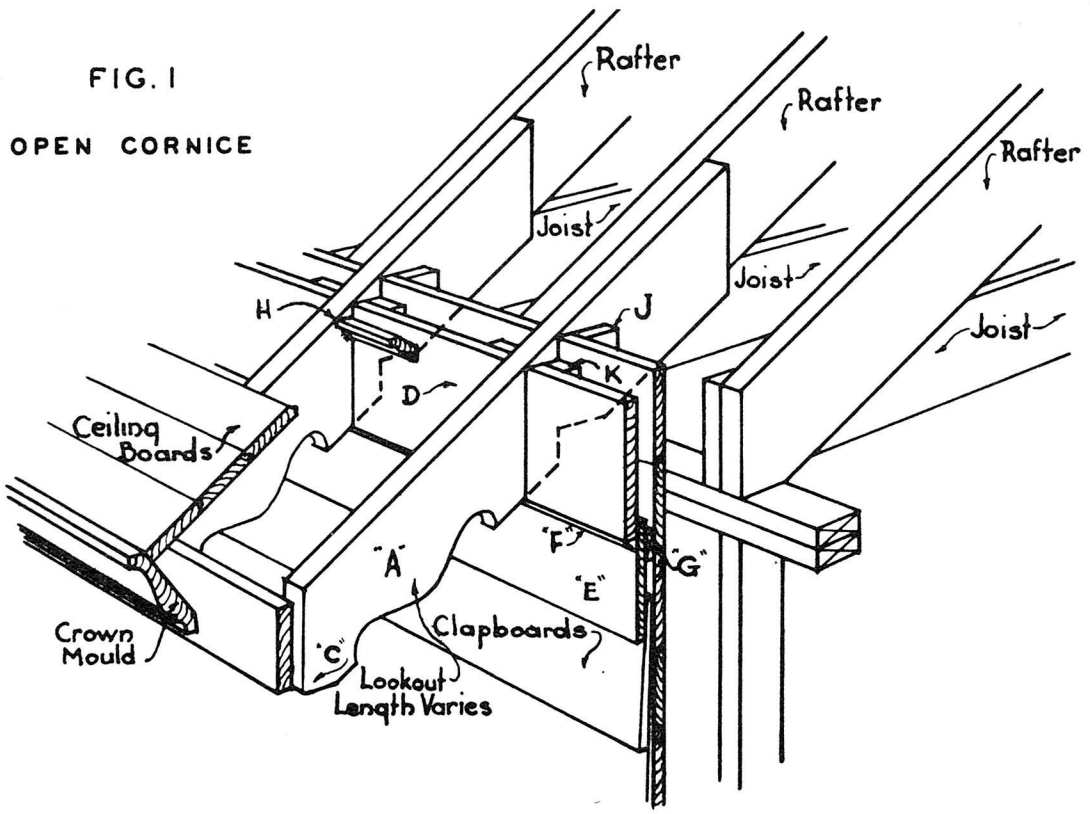
A. HOW TO PLACE THE TAIL RAFTERS

1. Lay out and cut the required number of tail rafters (A, Fig. 1).

NOTE: The plumb cut of the end of the rafter and the seat cut are found by using the rise and run figures of the common rafter on the steel square. The length of the tail rafter is found in a similar manner to the common rafter tail in Unit 1C-T45.

FIG. 1

OPEN CORNICE



2. Secure a tail rafter to the sides of the common rafters at each end of the building by nailing them temporarily so that the top of the tail rafter is flush with the top of the common rafter.

3. Stretch and secure a chalk line from the top outermost edge of one tail rafter to a similar edge on the other tail rafter.

4. Check the position and elevation of the outermost edges of the tails so that they are in alignment with one another and in accordance with the dimensions given for the overhang.

5. Securely spike the tail rafters to the sides of the common rafters and to the plate.

6. Spike the intermediate tail rafters to the common rafters, keeping the ends in alignment with the chalk line.

NOTE: If the rafter tails extend beyond the building line 2 ft. or more, they should be braced temporarily to the side of the building so that they will not sag when the roof boards and shingles are being placed. If the tail rafters are to have a sweep, nail them to the common rafters as shown in Fig. 7, Unit 1C-T57.

B. HOW TO PLACE THE FRIEZE BOARDS

NOTE: In building an open cornice it is more convenient to place the frieze boards between the tail rafters before the fascia boards at the ends of the tails are nailed in place. In Fig. 1, a double frieze board (D and E) is used. To apply this type of frieze the order of procedure is as follows:

1. Cover the sheathing with building paper where the frieze board is to be nailed.

2. Snap a chalked line the full length of the wall to show the location of the bottom of the frieze board E. Allow the top of this frieze to be about $\frac{1}{2}$ in. above the bottom edge of the rafter tails at the face of the sheathing.

3. Cut small furring blocks G of the same thickness as the top edge of the siding that is to be used. These blocks should be about 2 in. wide and about 6 in. long.

NOTE: These blocks are to be used to fur the frieze E out from the face of the sheathing so that siding may be slid behind the bottom edge of the frieze.

4. Nail the furring blocks to the sheathing at each stud location near the top of the frieze board.

5. Square the ends of enough frieze stock to reach to the ends of the cornice.

NOTE: If a return cornice is to be provided, be sure to miter the ends of the frieze at the ends of the cornice or wall. See B, Fig. 2.

6. Nail the frieze to the building, keeping the bottom edge in line with the chalk line. Nail only the top edge of the frieze, leaving the bottom edge loose. This edge should be nailed solidly after the siding has been put in place.

C. HOW TO FIT THE UPPER FRIEZE D BETWEEN THE RAFTER TAILS

1. Cut blocks about 3/4 in. x 3 in. x 5 in. and nail them to the sides of the tail rafters at the plate line. See J, Fig. 1 . The outside edges of these blocks should be in line with the inside face of the sheathing.

2. Continue the sheathing up to the top of the rafters by nailing short pieces between the rafters and against these blocks.

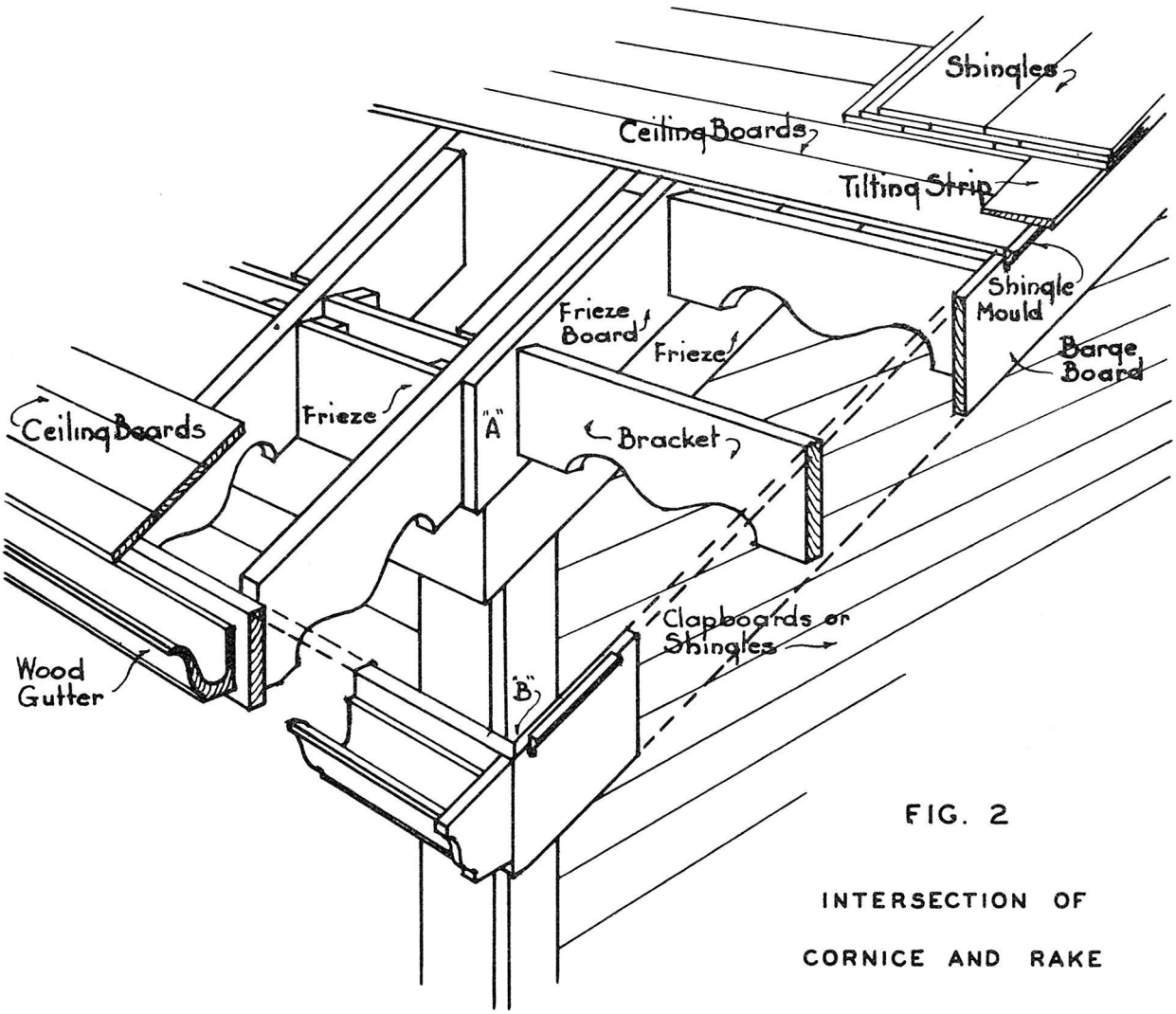


FIG. 2

INTERSECTION OF CORNICE AND RAKE

3. Apply building paper over the surface of the sheathing where the frieze is to be placed.

4. Nail furring blocks K on the face of the sheathing. These blocks should be the same thickness as the frieze board E plus the block G to fur the frieze board D to a vertical line.

5. Nail the frieze boards D between the rafters and against the blocks K. These boards should be wide enough to extend from the top edge to the bottom edge of the tail rafter.

6. Nail and fit the cove moulding F at the bottom edge of the frieze D. Fit and nail a quarter round or bed moulding at H flush with the tops of the rafters.

D. HOW TO PLACE THE FASCIA BOARD

NOTE: In Fig. 1 the fascia board is shown at C.

1. Select straight dressed stock wide enough to reach from the bottom of the roof boards to about ½ in. below the level cut at the end of the tail rafter.

2. Square one end of a length of fascia board. Temporarily nail the board with 8d common nails to the plumb cuts of the tail rafters in the position as shown in Fig. 2. Allow the squared end to come half way on one tail rafter. The other end should extend beyond the end tail rafter far enough to allow for the return of the fascia up the rake. See B, Fig. 2.

3. Square additional lengths and secure them all along the building.

4. Sight along the bottom edge of the fascia to check it for straightness. If necessary straighten it by withdrawing the nails and bringing the fascia into alignment.

5. Nail the fascia board securely to the tail rafters when it is straight.

E. HOW TO PLACE THE CROWN MOULDING

NOTE: In some cases a metal or wood gutter is used in place of the crown moulding. If a crown moulding is used it should be placed as follows:

1. Cut a piece of crown moulding about 6 in. long. Place it against the outside face of the fascia. Adjust it on the fascia so that the top edge of the crown moulding comes in line with the top of the roof board. See Fig. 1.

NOTE: Some carpenters prefer to have the top edge of the moulding about ½ in. above the roof board so as to form a tight fit between the top of the moulding and the first course of shingles.

2. Measure the distance between the bottom edge of the moulding and the bottom edge of the fascia.

3. Snap a chalked line along the full length of the fascia at this distance from the bottom edge.

4. Nail the bottom edge of the moulding at each rafter tail, keeping it lined up with the chalk line. The top edge may be nailed to the roof board. Set all the nails.

F. HOW TO PLACE CEILING ON AN OPEN CORNICE

NOTE: In placing a ceiling for an open cornice, be careful to use stock thick enough so that the shingle nails will not protrude through the boards and be exposed to view.

1. Lay the ceiling on the top of the rafters as subfloor is laid, using toe nailing only where the boards do not come together tightly. Face nail with 6d nails and be sure to have the beaded side down. Be sure that no loose knots come between the rafter tails.

2. Allow the boards to project beyond the end rafter the length of the rake overhang.

G. HOW TO BUILD THE RAKE OF AN OPEN CORNICE

1. Straighten the outside common rafter up the rake of the roof by temporarily nailing a stay across the bottom edges of about four common rafters.

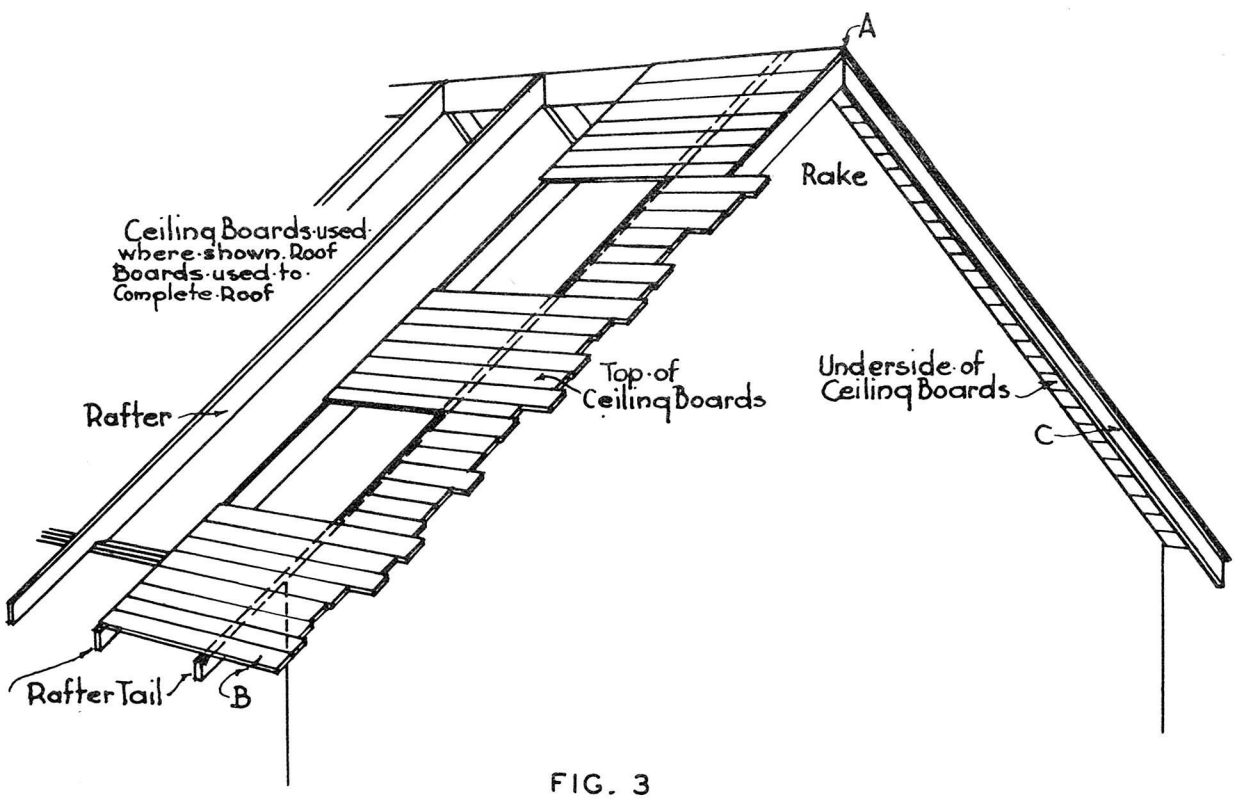


FIG. 3

METHOD OF APPLYING CEILING BOARDS ON RAKE

2. Apply the ceiling boards up the rake. Allow six or eight lengths of the boards to extend back to the second common rafter so as to support the overhang. These sections should be placed about every 2 ft. up the rafter. See Fig. 3. The other ceiling boards should extend out from the first common rafter the width of the overhang.

3. Determine the distance the outside face of the bargeboard is to be from the sheathing. Mark this distance on the top of the ceiling boards near the ridge and at the eaves. See A and B, Fig. 3.

4. Snap a chalked line connecting these two points and saw off the ceiling boards along this line.

   NOTE: The bargeboard is the outermost exposed rafter that extends up the rake of the roof. It is nailed to the underside of the roof ceiling boards and forms a surface upon which the crown or shingle moulding is nailed. In reality, it is the horizontal fascia returned up the rake.

5. Cut a plumb and 45° miter on the lower end of a length of bargeboard stock. Use the figures on the steel square that were used to lay out the plumb cut of the common rafter for the plumb cut of the bargeboard (Fig. 4).

   NOTE: This cut is fitted to the miter cut of the horizontal fascia board. See B, Fig. 2.

6. Nail the bargeboard to the underside and outer edge of the ceiling boards. See C, Fig. 3.

7. Mark the length of bargeboard that is required to reach to the ridge of the roof. The top cut of the bargeboard, where it meets the bargeboard on the opposite side of the gable is found by using the square as in finding the plumb cut of the common rafter.

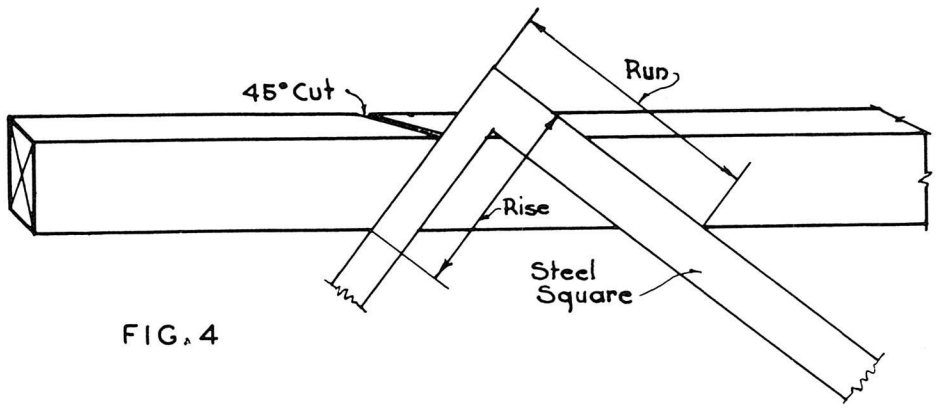


FIG. 4

MITER AND PLUMB CUT ON BARGE OR RAKE FASCIA

8. Finish nailing the bargeboard to all of the roof boards.

9. Fit the crown or shingle moulding to the face of the bargeboard. The cuts at the lower and upper ends of the moulding are made parallel to the respective cuts of the bargeboard, or the moulding may be returned on itself. See B, Fig. 2. Keep the top edge of the shingle moulding flush with the top surface of the roof boards. See Fig. 2.

10. Nail the moulding to the bargeboard, using nails that will not protrude through the bargeboard.

NOTE: In some cases a tilt strip is nailed from the top of the roof boards to the top edge of the shingle moulding and projects about 1 in. over the face of the moulding. A 5 in. clapboard is sometimes used for this strip. See Fig. 2.

H. HOW TO BUILD AND INSTALL CORNICE BRACKETS

NOTE: Where the overhang is excessive at the rake, lookout rafters or brackets are built up the rake to support the overhang as shown in Fig. 2.

1. Use stock similar to that used for the tail rafters.

2. Lay out, square and cut the bracket stock using the same general curve as on the tail rafter. The brackets should be long enough to reach from the face of the frieze to the inside face of the bargeboard.

3. Nail the brackets in place, spacing them about 2 ft. o.c. up the rake of the roof with the faces vertical.

I. HOW TO INSTALL A HANGING GUTTER

NOTE: A wooden hanging gutter is shown at Fig. 2. When this type of gutter is used, it replaces the crown moulding. It is fastened to the fascia but instead of being level it is pitched from a high point to a low point in order to drain the water which is shed from the roof surface.

1. Locate the high point of the gutter and mark this point on the fascia. See the position of the gutter in relation to the roof boards in Fig. 2.

NOTE: If there are to be two conductor pipe outlets in the gutter, the high point should be located midway between the outlets.

2. Locate the low point of the gutter and mark this point on the fascia at the cutlets.

3. Snap a chalked line from the high point to the low point on the fascia.

4. Cut and fit the first length of gutter trough and nail or screw it temporarily to the fascia. Use cadmium plated screws or copper nails.

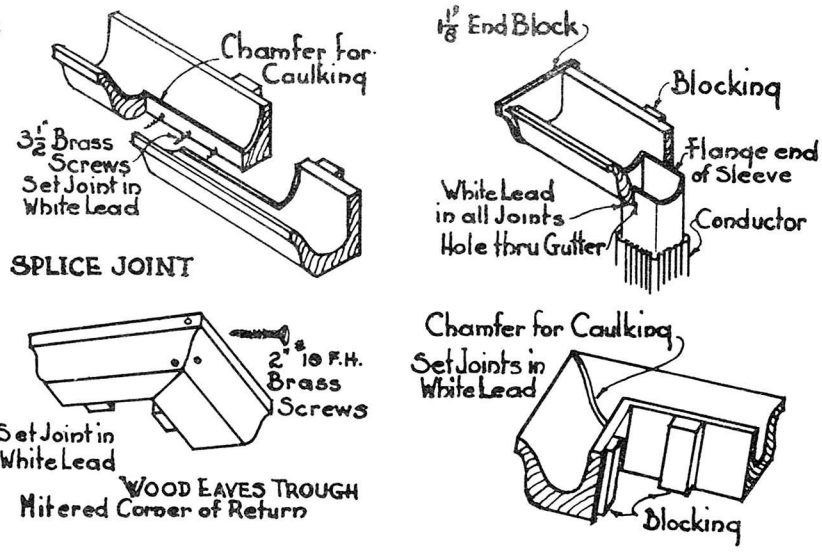


FIG. 5 ASSEMBLY OF WOOD GUTTERS

5. Mark the locations and layouts of the joints required in the full length of the complete gutter.

   NOTE: Figure 5 shows the methods of making the splice joint, miter joint and conductor pipe outlet. The end block at the end of the gutter trough is also shown.

6. Fit the remaining lengths of gutter trough together by using the splice joint shown in Fig. 5.

   NOTE: In making joints in this type of gutter, be sure the surfaces of the joint are square with the exception of a small bevel on the inside surface of the gutter trough. This bevel is later caulked with white lead and caulking.

7. Fit the miter joints and conductor outlets as shown in Fig. 5, using the same general procedure as in making the splice joint.

8. Assemble the complete gutter, by heavily painting the joint surfaces with white lead and screwing or nailing them together.

9. Fasten the gutter to the fascia permanently, being sure the bottom of the gutter is parallel to the chalked line and that there are no low spots in which the water may lodge.

   NOTE: In some cases small blocks of wood are nailed between the back of the gutter trough and the fascia so that if the gutter overflows the water will not run up under the shingles. Another method is to plane the outer edge of the gutter so that it is ½ in. lower than the back edge.

J. HOW TO INSTALL A STRIP GUTTER

NOTE: Figure 9, Unit 1C-T57 shows a strip gutter built on a shingled roof above the building line. The strip should be at least 1 1/16 in. thick and 2 5/8 in. wide and should be of clear white pine.

The lower courses of shingles should be laid before the strip gutter is installed but the courses above are laid after the gutter lining is nailed in place.

1. Locate the position of the high point of the gutter strip on the first course of shingles above the building line. See Fig. 9, Unit 1C-T57.

2. Locate the low point of the gutter strip in the same manner and on the same shingle course at the opposite end of the roof. Snap a chalked line connecting the high and low points.

NOTE: If the shingle spacing is 5 in., the low point should be 5 in. lower than the high point. The gutter should have a drain of at least 1/8 to 1/4 in. per running foot.

3. Spike the gutter strip on top of the shingle course so that the bottom edge of the gutter strip will be on the chalk line. Drive and set the spikes through the edge of the gutter strip so that they will go through the shingles and into the rafters.

NOTE: Check over the surface of the gutter on which the metal gutter lining will be placed. See that the nail heads are set below the surface and that this surface is smooth.

4. Place the gutter metal on the finished gutter with the soldered joints up and the lap of the soldered seam toward the low point of the gutter.

5. Mark straight lines along the gutter tin according to the locations of the bends on the surfaces of the gutter. These lines are shown in Fig. 9, Unit 1C-T57 where the metal is formed over the gutter strip and on the roof surface.

6. Partly bend the metal along these lines with a straight edge to form the metal so that it will fit on the gutter strip and roof.

7. Place the tin in the gutter and temporarily nail the top edge to the roof. Break the tin down into the trough of the gutter, up the inside face, and over the edge of the gutter strip. Nail it about every 3 in. on the top edge of the gutter strip.

8. Continue the shingling starting with a double course as at the eaves.

HOW TO BUILD A CLOSED OR BOX CORNICE WITH SLOPING PLANCIER

NOTE: Figure 8, Unit 1C-T57 shows a closed cornice with the plancier on the slope of the rafters. If this type of cornice is to be used, the rafter tails should be laid out and cut to accommodate the plancier, fascia and crown moulding before the rafters are nailed in place.

When laying out the rafters, a templet should be made to mark the rafter tails so they may be cut to accommodate the cornice members. This may be done by nailing together a short section of plancier, fascia and crown moulding to represent a section of the finished cornice. The rafter tails should be cut according to this templet.

1. Nail the fascia board to the ends of the rafters. This procedure is similar to fitting the fascia board in the open cornice.

2. Fit the plancier to the back of the fascia and nail it to the underside of the rafters.

3. Fit and nail the frieze board to the building in the same way the lower frieze board was applied to the open cornice.

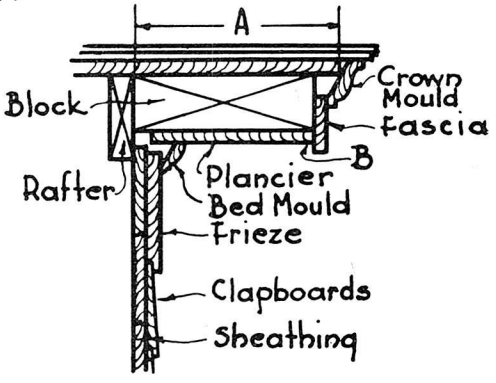
4. Fit and nail the moulding at the intersection of the plancier and frieze.

5. Fit and nail the crown moulding or wooden gutter to the fascia as in fitting this member to the open cornice.

NOTE: The return up the gable rake of this type of cornice is composed of the same number and types of materials as are used on the horizontal cornice.

6. Allow the roof boards to project over the outside common rafter the combined distance of the thickness of the frieze board, the width of the plancier and the thickness of the fascia. See A, Fig. 6.

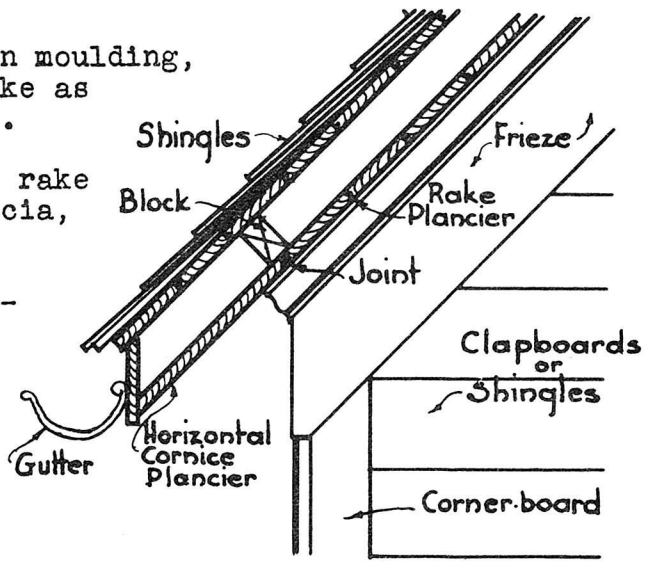
7. Nail blocks about every 4 ft. to the underside of the roof boards. These blocks should be the proper thickness to bring the bottom face of the rake plancier in line with the bottom face of the horizontal plancier. See Fig. 6 and 7.



SECTION OF RAKE
CLOSED OR BOX CORNICE
FIG. 6

8. Fit and nail the fascia, crown moulding, plancier and frieze up the rake as explained in the open cornice.

   NOTE: Figure 7 shows how the rake cornice, plancier, fascia, crown mould and frieze intersect with these members of the horizontal cornice.



SECTION SHOWING HORIZONTAL AND RAKE PLANCIER JOINT

FIG. 7

HOW TO MAKE A BOX CORNICE WITH A LEVEL PLANCIER

1. Cut the required number of lookout brackets (B, Fig. 8) to the correct length and width as determined by the size of the fascia and plancier.

2. Nail these brackets to the studs, lining them up with a chalk line.

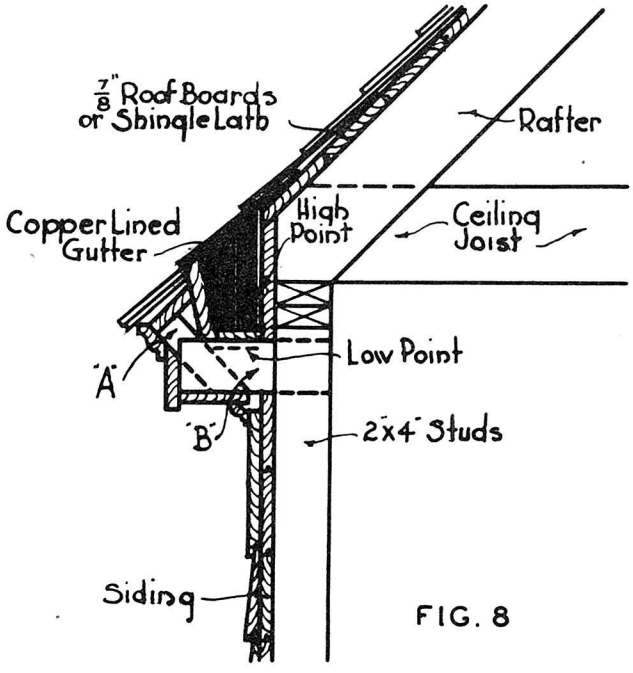


FIG. 8

BOX CORNICE WITH BUILT IN GUTTER

3. Nail the plancier to the bottom of the brackets.

4. Nail the fascia in place as shown in Fig. 8.

5. Nail the crown moulding in place.

6. Nail the brackets A to the brackets B. They should rest against the back of the crown moulding.

   NOTE: The top ends of these brackets should be lined up with a chalk line so they are in the same plane as the top edges of the rafters.

7. Place the frieze and bed moulding as shown.

NOTE: If this cornice is to be returned as shown in Fig. 9, and the return plancier is to be the same width as the cornice plancier continue as follows:

NOTE: If this type of cornice return is to be used, it should be erected before the rake cornice is applied. The rake cornice is then fitted to the top of the return.

8. Cut the blocks (Fig. 9) to the proper length.

9. Nail these blocks in place as shown.

10. Square the end of the cornice plancier.

11. Cut and nail the return plancier in place to the edge of the blocks.

12. Miter and return the fascia around the end and back edge of the plancier to the building.

13. Miter and return the crown moulding around the fascia and back to the building. Miter and return the frieze and bed mould around the corner of the building.

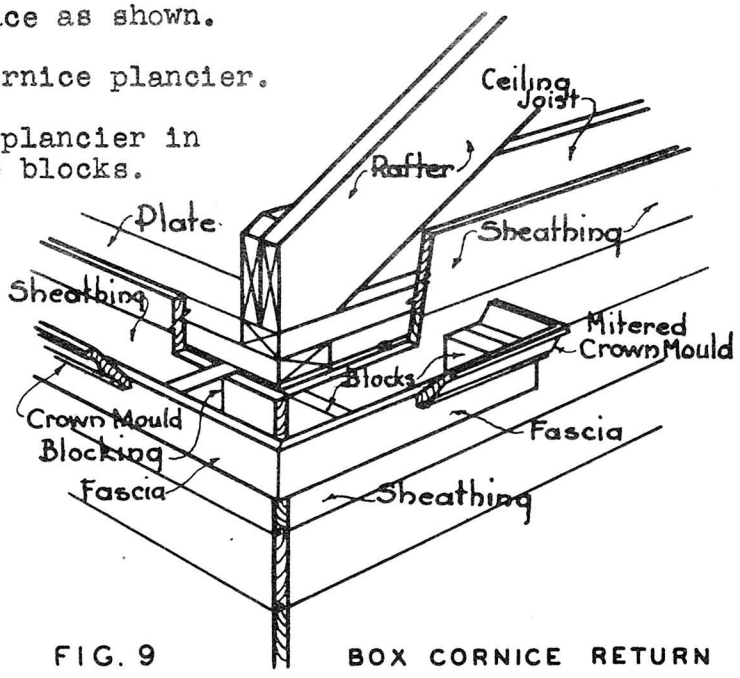


FIG. 9 BOX CORNICE RETURN

NOTE: The return moulding and fascia should be only temporarily nailed until after the siding is placed.

14. Cover the top of the return with sheathing and flashing.

HOW TO INSTALL A SUNKEN GUTTER IN A BOX CORNICE

1. Lay out the high point of the gutter on the outer end of a bracket at the end of the building (Fig. 8).

2. Lay out the low point of the gutter on the outer end of a bracket at the opposite end of the building. See dotted line at B, Fig.8.

3. Snap a chalked line between these points across the ends of the intermediate brackets.

4. Transfer these points in on the brackets and complete the layout for the gutter trough on each bracket.

5. Cut out these notches for the gutter.

6. Nail the three members of the gutter trough in place (Fig. 8).

7. Check the inside of the trough to see that it is straight and free from protruding nails.

8. Break the metal gutter lining over the top of the gutter, down the side and around the gutter trough in the same manner as for the strip gutter of the open cornice.

NOTE: This may require the services of a tinsmith.

HOW TO BUILD A SNUB CORNICE

1. Make a templet with a piece of crown moulding and frieze about 6 in. long to show a section of the assembled members (Fig. 10).

2. Hold the templet against the building and along the side of a rafer tail. Keep the top edge of the crown moulding flush with the top surface of the roof boards.

3. Mark the tail rafter of one end of the building at the back side of the crown moulding. This line will give the angle at which the rafter tail is to be cut (Fig. 10).

4. Mark the bottom edge of the frieze on the building. This point will give the position in which the frieze is to be nailed.

5. Mark the tails of the rafters and the sheathing in the same manner at the other end of the building.

6. Snap a chalked line connecting these marks and cut the rafter tails accordingly.

7. Secure the frieze and crown moulding in position.

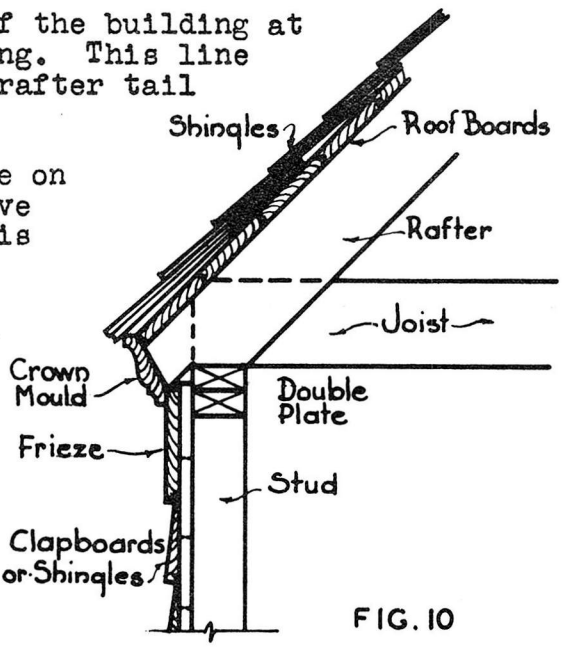


FIG. 10

SNUB CORNICE

DESCRIPTION OF WOOD SHINGLES

OBJECTIVES OF THE UNIT

1. To describe the selection of roofing materials.
2. To describe shingle lath and roof boards and their functions.
3. To describe wood shingles and their characteristics.
4. To describe the selection of shingles and other materials needed for a shingled roof.
5. To explain how to estimate the quantity of materials needed for a roof.

INTRODUCTORY INFORMATION

At one time, the wood shingle was almost universally used for covering the roof of a frame structure. During recent years they have been replaced to some extent by composition materials in the form of roll, strip and individual shingles.

The durability, cost of placing, cost of the materials, insulation value, fire resistance and atractiveness vary considerably with the type of roofing. However, each type of material must be properly manufactured, selected and applied to obtain satisfactory results.

Only those roofing materials commonly applied by carpenters will be considered in this book.

SELECTION OF ROOFING MATERIALS

The pitch of the roof surface must be considered in selecting the roof material. In localities where there is excessive rain and snowfall, the shingled roof should have a pitch of at least 9 in. to the foot. The pitch of a shingled roof should never be less than 6 in. to the foot. This is especially true when composition strip shingles are used, and a driving wind may damage the shingles. The more readily the water can be drained from a wood shingled roof, the longer the roof will last.

Ready roofing such as roll, tar paper and the flint coated heavier felts should not be laid on a surface unless it has a slope of at least 1 in. to the foot. Strip and individual composition shingles should never be laid on a surface of less than 6 in. rise to the foot. Canvas decking may be laid on a surface having at least ¼ in. rise to the foot. Tin or copper is also used where the slope is small, but seldom where the deck is to be walked upon.

SHINGLE LATH

Shingle lath, sometimes called roof boards, are usually strips of wood 1 in. x 3 in. or 1 in. x 4 in. nominal size. Hemlock is most frequently used for this purpose in these sizes. Other materials such as North Carolina pine, spruce, and fir generally come dressed two sides and two edges to 3/4 in. x 2 5/8 in. and 3/4 in. x 3 5/8 in. They come in standard lengths. Only clear straight stock should be used, as the chief function of these parts is to brace the roof rafters and to form a solid and true base upon which to nail the wood shingles.

ROOF BOARDS

Roof boards are laid on the rafters in about the same way as sheathing is laid on side wall studs. There is a difference of opinion as to whether solid roof boards or shingle lath spaced a few inches apart are best. The solid roof boards make the roof somewhat more rigid and provide better insulation and fire resistance than the spaced shingle lath. It is sometimes claimed that shingles over lath are less subject to decay than those over solid roof boards because of the better ventilation they receive. However, this is open to question. The material cost and labor are less for shingle lath than for solid roof boards.

WOOD SHINGLES

The best shingles are sawed from cypress, western red cedar and redwood. In some sections of the country, eastern white cedar, white pine and the soft southern pines are used. The basic grades of shingles according to the American standards for shingles are grades No. 1, No. 2 and No. 3.

Grade No. 1 shingles are strictly clear edge grain and free from sap. They come in lengths of 16, 18 and 24 in. and in random widths of 3 or more inches. The butts or thickened ends come in thicknesses of 4/2 in., 5/2½ in. and 5/2 in. This means that when 4 shingles are

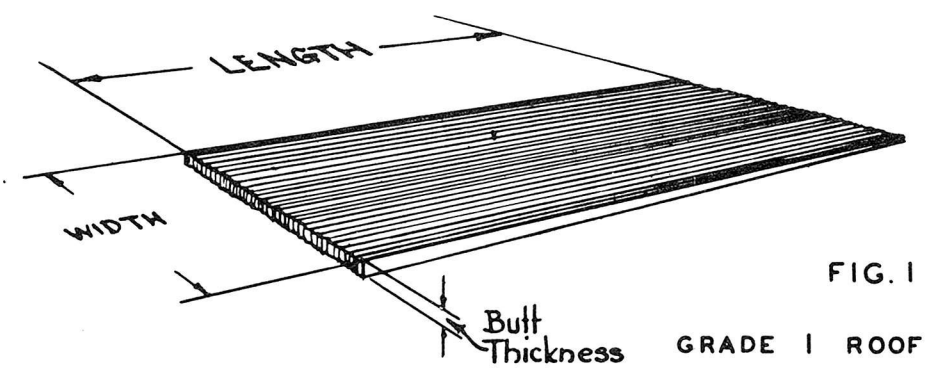


FIG. 1

GRADE 1 ROOF SHINGLE

laid on top of one another, the butt ends in the first case measure a total of 2 in. in thickness or 1/2 in. each. In the second case it means that 5 butts will measure 2¼ in. in thickness. In the third case, 5 butts will measure 2 in. in thickness. See Fig. 1.

24 in. shingles are 4/2 in. at the butts
18 in. shingles are 5/2¼ in. at the butts
16 in. shingles are 5/2 in. at the butts

Grade No. 2 shingles are strictly clear mixed edge and flat grain. These shingles are made in lengths of 16, 18 in. and 24 in. They may not be under 3 in. wide and a small amount of sap is permitted. The butt thicknesses are the same as for the No. 1 shingles.

Grade No. 3 shingles must be clear for the bottom half of their length. None of the shingles may be narrower than 2½ in. The butt thicknesses are the same as for the No. 1 shingles.

CHARACTERISTICS OF SHINGLES

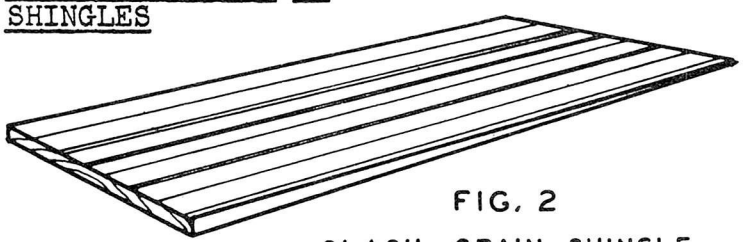


FIG. 2
SLASH GRAIN SHINGLE

Shingles have a tendency to curl and hold moisture if the grain is flat or slash grain. No shingle having slash grain should be wider than 10 in. and it should be laid with the annual rings pointing down. See Fig. 2. Badly crossgrained shingles should not be used. The color of the shingle is no defect in any grade unless it is discolored by the presence of excess sap or decay.

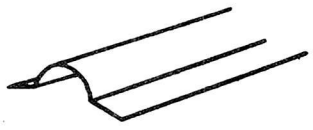
SHINGLE NAILS

The shingle nail is an important factor in the durability of a shingled roof. The common wire nail should not be used because of its poor resistance to rust and its poor holding ability. The best nails to use are zinc-coated or galvanized nails. The length of the nail to be used is determined by the thickness of the shingles. If they measure 5 butts to 2 in. they should be nailed with 3d nails. Thicker shingles should be fastened with 4d nails. The 3d nails have flat heads 5/16 in. in diameter and are 1¼ in. long. The 4d nails have flat heads 5/16 in. in diameter and are 1½ in. long. There are about 382 of the latter size to the pound.

METAL FLASHINGS

Metal flashings are strips of metal used in the valleys and intersections of the roof surfaces to form a channel for the water

to drain. The metal should be copper, zinc, lead, or heavily coated tin painted with red lead on both sides.



METAL RIDGE ROLL

FIG. 3

METAL RIDGE AND HIP ROLL

The ridge and hips of a shingled roof are sometimes covered with various shaped metal coverings the most common of which is shown in Fig. 3. The material is generally copper or at least 20 gauge galvanized iron. It should be painted in the same manner as the flashing.

METHODS OF ESTIMATING ROOFING MATERIALS

A. AREA OF ROOF SURFACES

Figure 4 shows one side of a roof which is to be shingled. To find the total area of this side of the main roof and gable it is most convenient to divide the roof surface into squares, rectangles and triangles.

The left side of the front section of the roof is composed of rectangle A and triangle B. The area of A is found by multiplying the length of the main common rafter including the overhang by the length of the plate E. The area of triangle B is found

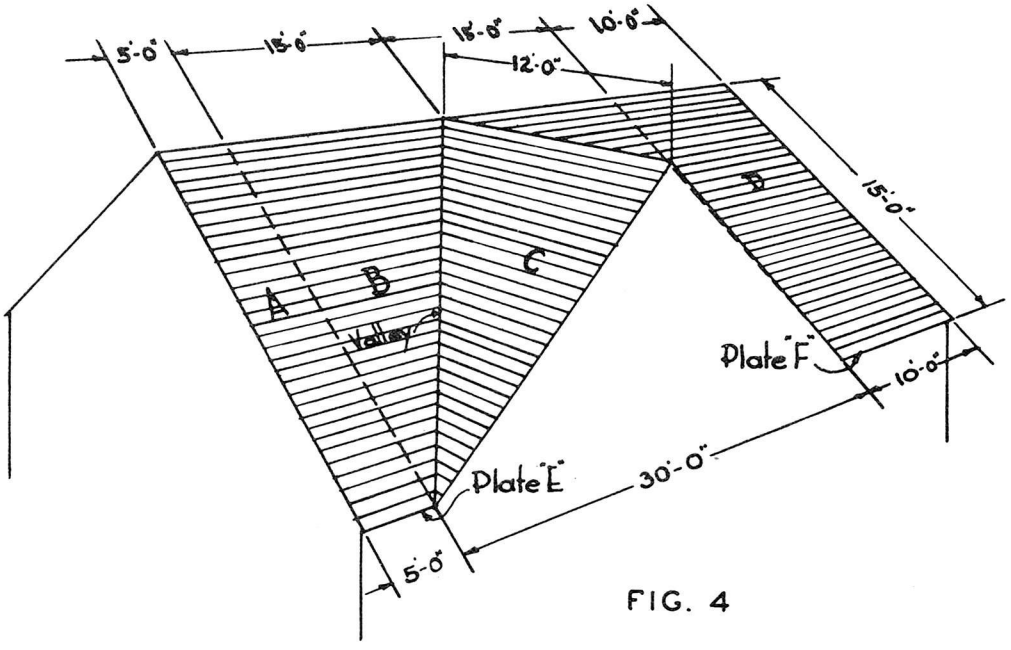


FIG. 4

ROOF SURFACES

by multiplying the length of the main roof common rafter by the length of the ridge above the triangle and dividing by 2. There would be a corresponding triangle on the other side of the gable.

The area of the triangle C is found by multiplying the length of the gable ridge by the length of the gable common rafter and dividing by 2. The other side of the gable roof would have the same area.

The section D is found by multiplying the length of the plate F by the length of the main common rafter.

Section A - 5 ft. x 15 ft.	=	75	sq. ft.
Section B - 15 ft. x 15 ft. ÷ 2	=	112½	sq. ft.
Section same as B on other side of gable	=	112½	sq. ft.
Section C - 12 ft. x 15 ft. ÷ 2	=	90	sq. ft.
Section same as C on other side of gable	=	90	sq. ft.
Section D - 10 ft. x 15 ft.	=	150	sq. ft.
		630	sq. ft.

If there are no roof projections on the opposite side of the ridge, the area for this side may be found by multiplying the length of the ridge by the length of the common rafter. In this case the total length of the ridge is 45 ft. 45 ft. x 15 ft. = 675 sq. ft.

Straight side of roof	=	675 sq. ft.
Gable side of roof	=	630 sq. ft.
		1305 total sq. ft.

Allowances must be made if there is to be an overhang at the rake of the roof at the gables.

B. ESTIMATING WOOD SHINGLES

Shingles are bought by the square or in bundles. Four bundles make a square or enough to cover 100 sq. ft.

In the previous example there are 1305 sq. ft. or roof surface to be shingled. To this should be added 8% for waste, making a total of 1409 sq. ft. This area divided by 100 will give a little over 14 squares. Since there are four bundles in a square it will be necessary to order 57 bundles. There is some extra waste in cutting shingles for hips and valleys but this need not be considered unless there are a number of dormers, valleys or hips.

C. ESTIMATING ROOF BOARDS

If matched boards are laid tight, twenty per cent should be added to the total roof surface to find the amount of roof boards. No deductions for small openings such as chimneys need be considered.

If shingle lath are to be used and if they are to be spaced a distance equal to the shingle exposure minus the width of a lath, one half of the roof area should then be deducted to determine the number of board feet required.

D. ESTIMATING SHINGLE NAILS AND FLASHING

Approximately two pounds of 3d nails are required for every square of roof surface.

Flashing for valleys and strip gutters should be at least 16 in. wide. The length is determined by the number of linear feet in the valley or gutter, allowing about one foot extra on each end to allo for lap and pockets.

Flashing used for sides of dormers should be at least 5 in. x 7 in. Flashing is needed for every course of shingles that intersects the side of the dormer.

SELECTED REFERENCES

Audels Carpenters and Builders Guide #4 ..... Graham and Emery

Wood Construction ..... National Committee on Wood Utilization

Carpentry ..... Townsend

How to Estimate ..... Townsend, Dalzell, McKinney

Certigrade Handbook of Red Cedar Shingles ... Grondal and Woodbridge

HOW TO LAY WOOD SHINGLES

OBJECTIVES OF THE UNIT

1. To show how to lay roof boards.
2. To show how to apply the starting course of shingles.
3. To explain how to layout and align courses.
4. To show how to provide scaffolds for shingling.
5. To show how to flash and shingle a hip and a valley.

INTRODUCTORY INFORMATION

The careless application of a wood shingle roof will greatly shorten its life. If the shingles are properly selected and correctly applied with the proper nails, they will often provide a satisfactory roof for 25 years or more. Wood shingles may cost more to apply than some other types of roofing but the maintenance is likely to be less, especially where the roof surface is subjected to heavy loads.

TOOLS AND EQUIPMENT

Rule
Chalk line and chalk
Shingle hatchet or hammer
1 1/2 in. firmer chisel
Crosscut saw
Steel square
2 in. firmer chisel
Tin snips

PROCEDURE

HOW TO LAY ROOF BOARDS

NOTE: Assume that shingle lath 3/4 in. x 2 5/8 in. are to be used as roofing boards.

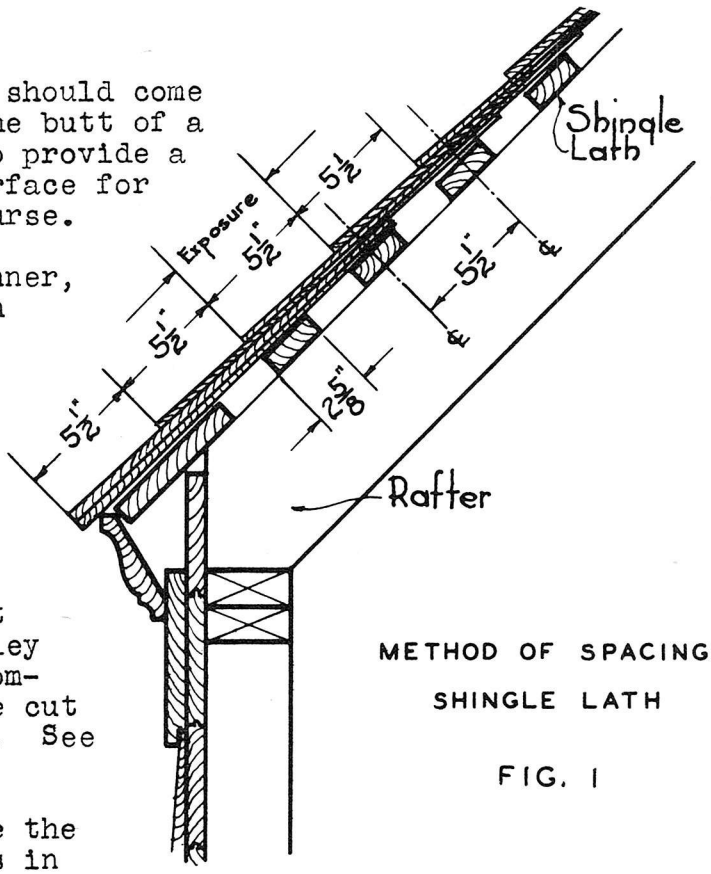
1. Nail the first board to the top of the rafters and nail through the edge of the moulding into this board (Fig. 1). The first board may have to be wider than 2 5/8 in. so it can be nailed to the rafters.

2. Space the roof boards about 3 in. apart or space them the same distance apart from center to center as the shingle exposure. This distance for an 18 in. shingle is 5 1/2 in. as shown in Fig. 1. Fasten each board to each rafter with two 8d nails.

NOTE: This spacing will vary as the length of the shingle and the width of the shingle lath vary. The lower edge of

the shingle lath should come directly under the butt of a shingle course to provide a solid nailing surface for the preceding course.

3. Continue in the same manner, keeping the shingle lath parallel to one another over the entire roof surface.



METHOD OF SPACING SHINGLE LATH

FIG. 1

HOW TO FIND THE VALLEY AND HIP CUTS ON ROOF BOARDS

NOTE: The cut for the roof boards or shingle lath that run into the valley of the roof is composed of the face cut and the edge cut. See Fig. 2.

1. To find the face cut use the steel square the same as in laying out a rafter. Use the unit of run of the rafter and the diagonal length per foot of the rafter. Mark and cut on the run side of the square.

EXAMPLE: On a roof with a rise of 8 in. and a run of 12 in. the figures would be 12 and 14 3/8, the latter being the diagonal of 8 on 12. Cut along 12.

2. To find the edge cut use the rise and the diagonal length per foot of rafter. Mark and cut on the rise.

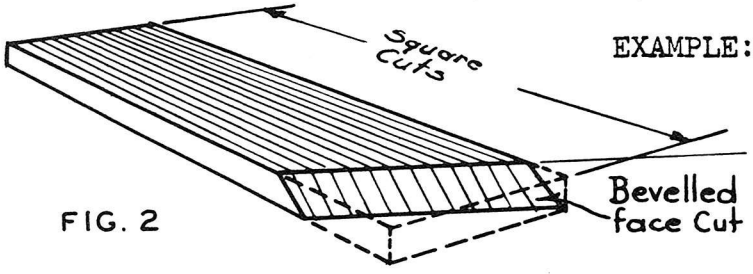


FIG. 2

VALLEY CUT ON ROOF BOARD

EXAMPLE: On a roof with a rise of 8 in. and a run of 12 in., the figures would be 8 and 14 3/8. Cut on 8.

NOTE: These cuts would also be used for the roof boards meeting over the hips.

HOW TO LAY WOOD SHINGLES

NOTE: Assume that a straight roof with gable ends is to be shingled.

1. Nail a shingle at one end of the roof to the roof boards and the crown mouldings of the rake and horizontal cornice Fig. 3. The shingle butt should project 1¼ in. below the horizontal moulding. The edge of the shingle should project 1 in. over the rake crown moulding. Place the nails in the shingle as shown, keeping them at least 1¼ in. from the edges and from the butt of the shingle.

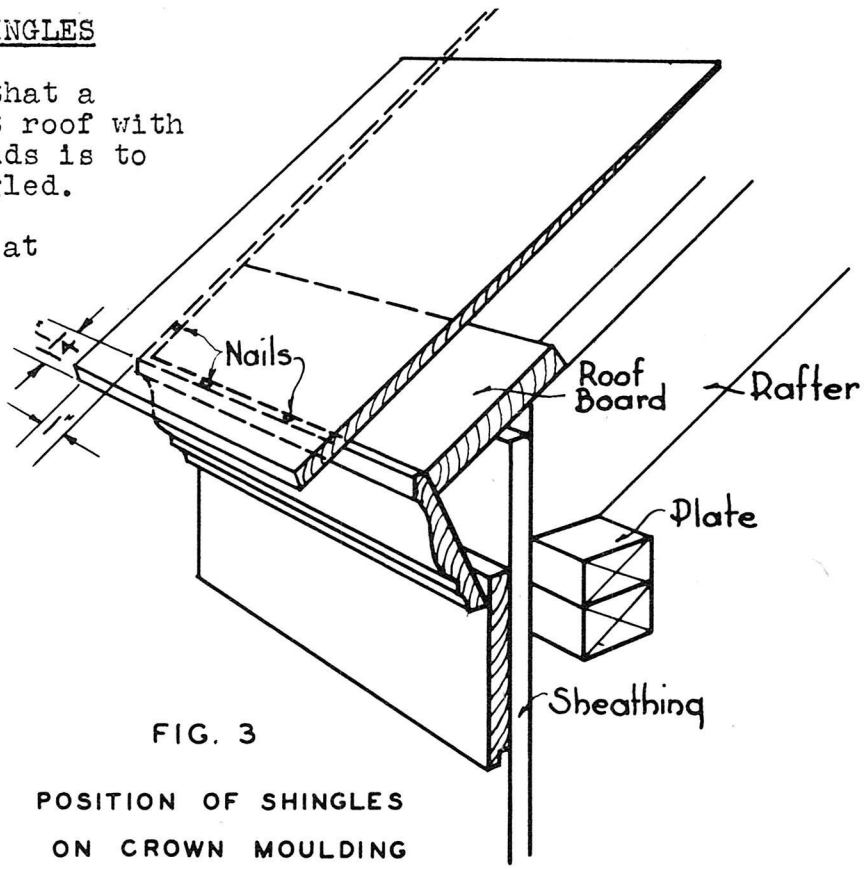


FIG. 3

POSITION OF SHINGLES ON CROWN MOULDING

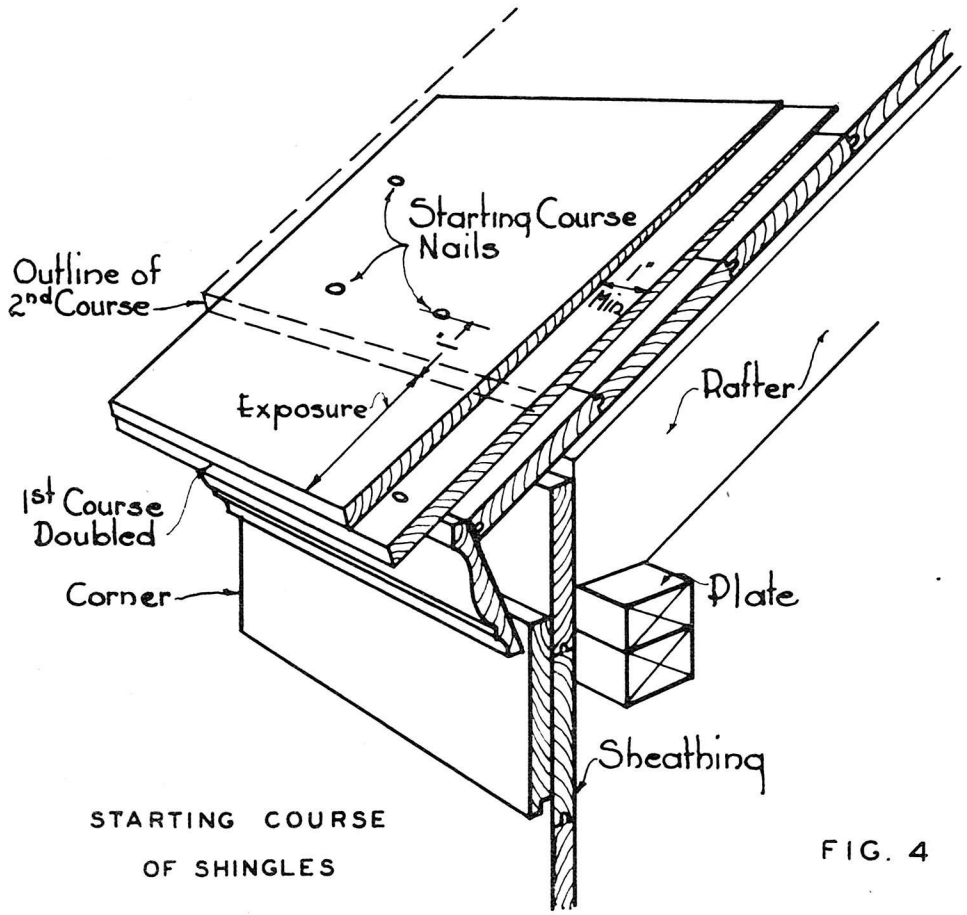
2. Nail a shingle in the same manner at the other end of the roof.

3. Stretch and fasten a chalk line from the butt of one shingle to the butt of the other.

   NOTE: If the distance from one end of the roof to the other end is over 14 ft., nail a shingle to the roof boards, as at the ends, every 14 ft. Fasten the chalk line to the butts of these shingles to prevent it from sagging.

4. Continue to lay the shingles side by side 1/8 in. apart and over the entire length of the roof. These shingles need only be nailed at the butts. The nails should be kept 1 in. from the edge and 1¼ in. from the butt and should be driven into the horizontal crown moulding.

   NOTE: Use only straight grain shingles and split all shingles over 9 in. in width, nailing the split sections as indiv-



STARTING COURSE OF SHINGLES

FIG. 4

idual shingles. All shingles should be nailed with two nails unless they are less than 4 in. wide. Do not drive the heads of the nails into the shingles below the surface but keep them flush.

5. Lay another course of shingles on top of the first course (Fig.4). Nail the end shingles to the rake moulding in the same manner as the first course. Be sure to keep the nails far enough above the butts so that they will be covered by at least 1 in. of the succeeding course. The nails should not be closer than 1 in. to the edge of the shingle.

6. Space a shingle on each end of the building on the rake crown moulding as shown at A, Fig. 5. This space is the width of the shingle course or the exposed length of the shingle. Snap a chalk line between the butts of these two shingles.

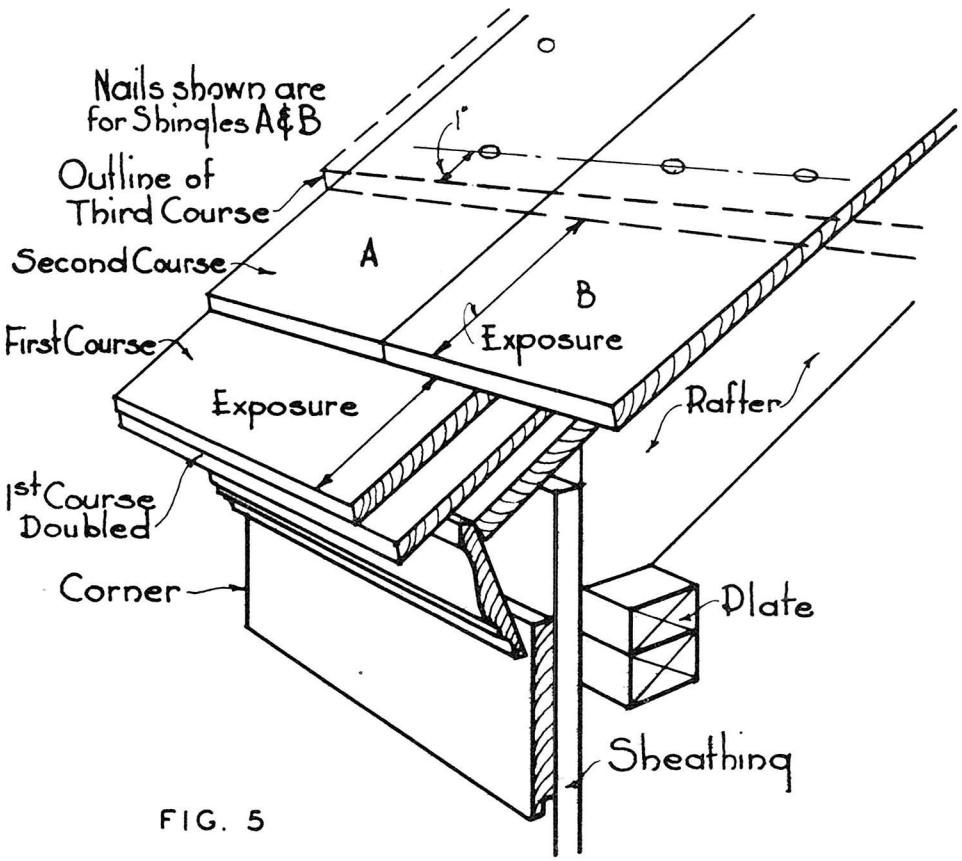


FIG. 5

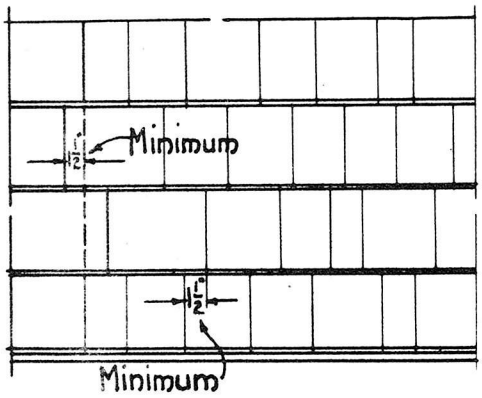
SECOND COURSE OF SHINGLES

NOTE: Another method in place of the chalk line is to use a straight edge from the butt of one shingle to that of the one on the opposite end of the roof. Generally a piece of clapboard the width of the shingle course is used.

7. Nail the second course of shingles in the same manner as the starting course with the butts along the chalk line.

NOTE: Some carpenters prefer to nail three shingles up the rake moulding at each end of the roof, spacing them up the rake according to the width of the courses. A chalked line is then snapped between the butts of each pair of shingles. This marks three guide lines across the roof for the succeeding courses.

8. Break all side joints of the second course of shingles 1½ in. away from the side joints of the starting course. No joint should come directly over another on any three consecutive courses. See Fig. 6.



BREAKING SHINGLE JOINTS

FIG. 6

9. Continue laying the courses of shingles up the roof in the same manner as described for the second course.

10. Secure a foot rest every 6 ft. up the roof.

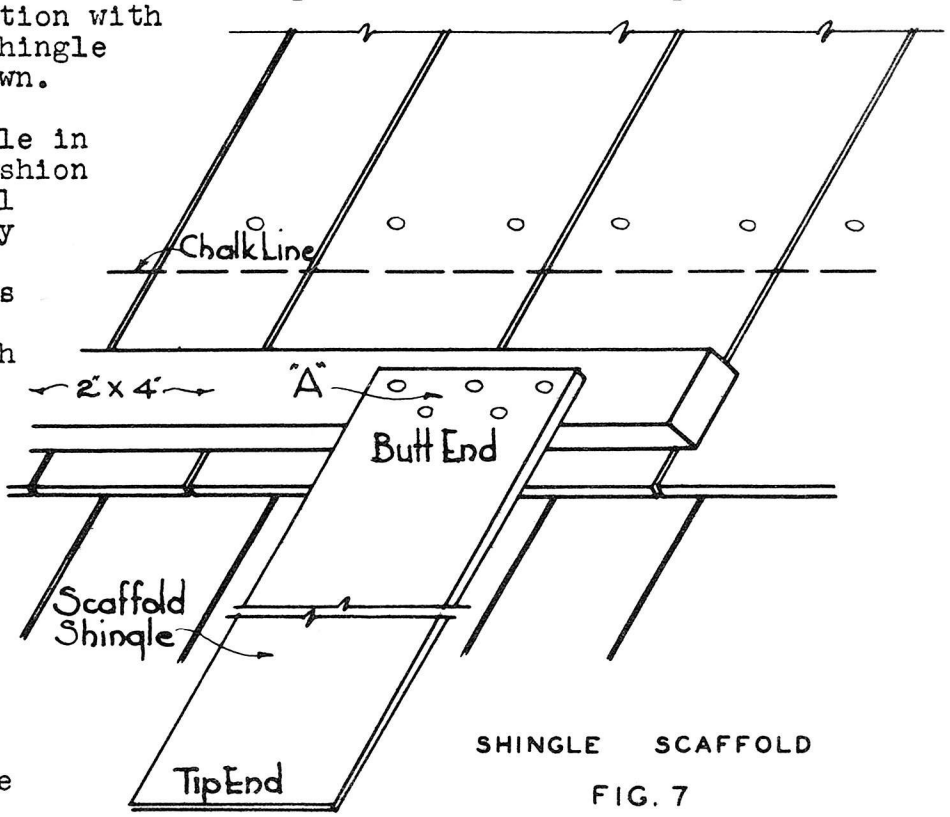
HOW TO BUILD A FOOT REST FOR SHINGLING

1. Select a 2 x 4 free of knots or fractures and about 12 ft. long. Lay it parallel to the shingle line on the roof with one end even with the end of the roof.

2. Place three 4 or 5 in. shingles on the face of the 2 x 4, one about 4 in. from each end and one in the middle. Place the butts of the shingles on the 2 x 4 as shown in Fig. 7. Be sure that the butts extend at least 1½ in. across the 2 x 4 and that they center on the joints of the shingle course above. See A, Fig. 7. Nail each shingle to the 2 x 4 in this position with about five shingle nails as shown.

3. Nail a shingle in a similar fashion to additional 2 x 4's every 6 ft. Use enough pieces to cover the entire length of the roof. See Fig. 8.

4. Turn the 2 x 4 over so that the shingles take the position they would if being nailed to the course marked by the



SHINGLE SCAFFOLD

FIG. 7

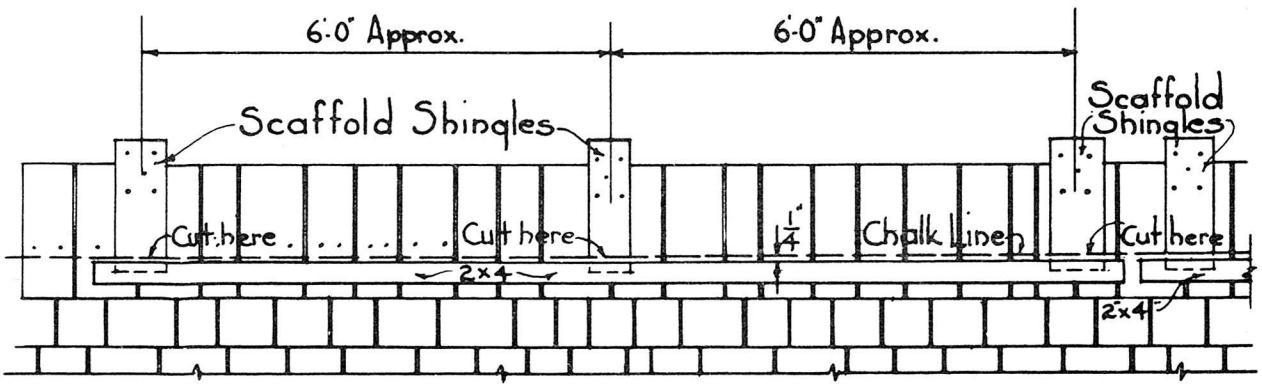
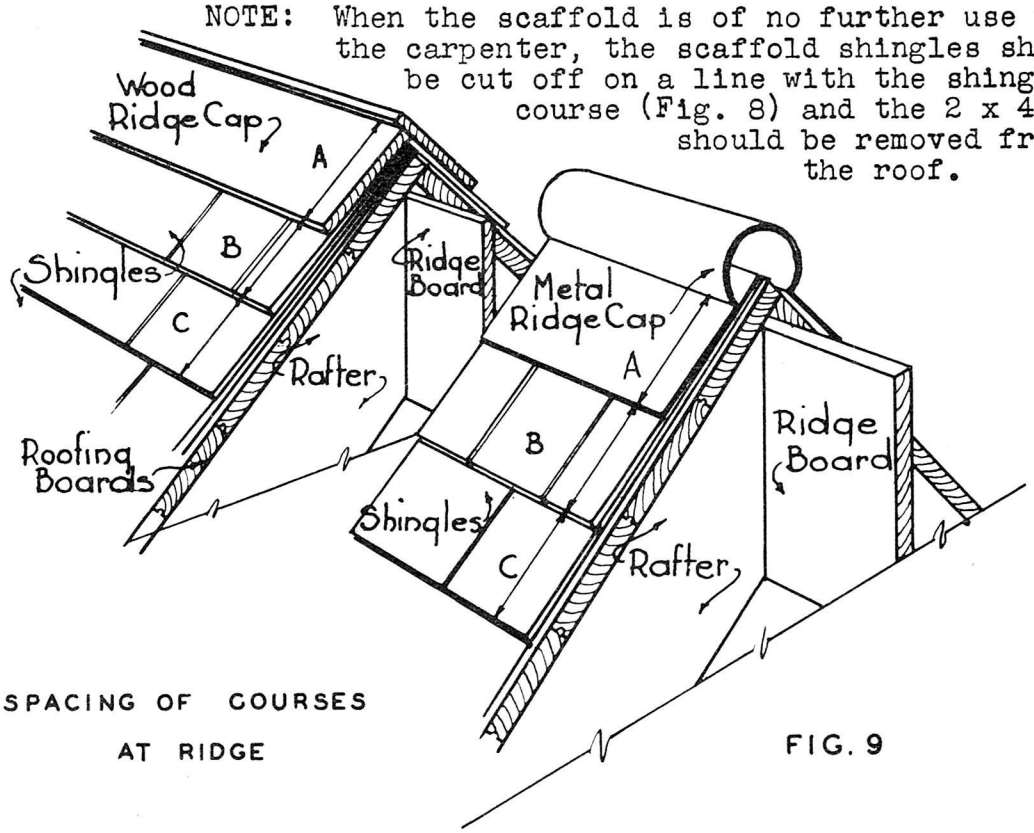


FIG. 8 METHOD OF APPYING FOOT REST

chalk line in Fig. 7. Adjust the 2 x 4 so that the top edge comes about $\frac{1}{4}$ in. below the chalk line (Fig. 8).

5. Nail the scaffold shingles to the roof. Keep the nails in a similar position to those of the other shingles but drive at least five nails into each of these shingles.

NOTE: When the scaffold is of no further use to the carpenter, the scaffold shingles should be cut off on a line with the shingle course (Fig. 8) and the 2 x 4 should be removed from the roof.



SPACING OF COURSES AT RIDGE

FIG. 9

HOW TO SPACE THE SHINGLE COURSE AT THE RIDGE

NOTE: Figure 9 shows a metal ridge roll at the ridge of the roof. Sometimes a wood ridge covering is used. However, the space at A should be approximately equal to that of the shingle course in order to make these spaces appear equal.

1. Place the ridge covering in position on the ridge of the roof. This will locate the bottom edge of the covering. Mark this point on the roof surface.

2. Space off the distance from this mark to the bottom of a course of shingles when the shingle courses reach about 3 ft. from the ridge. These spaces should be as nearly the same as the regular shingle course as possible and should not exceed them by more than $\frac{1}{2}$ in.

HOW TO SHINGLE AND FLASH A HIP

A. WOVEN HIP

NOTE: Figure 10 shows a woven hip in which the shingles are placed over the top of the hip as the shingle courses

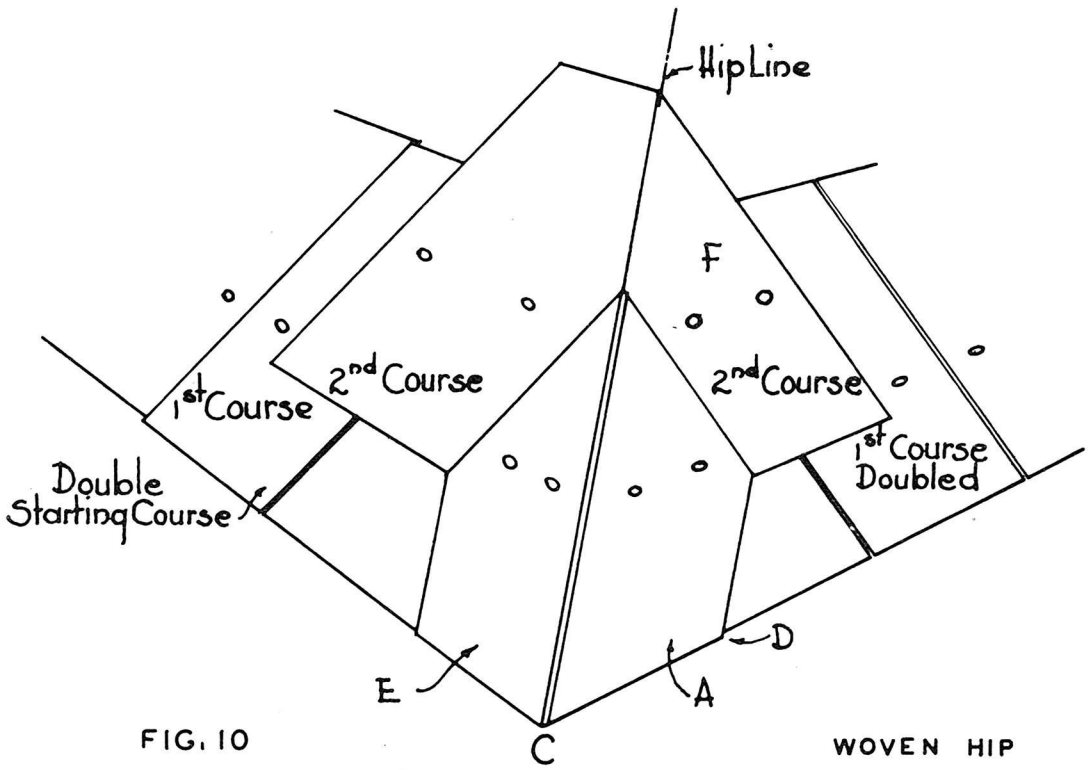


FIG. 10 WOVEN HIP

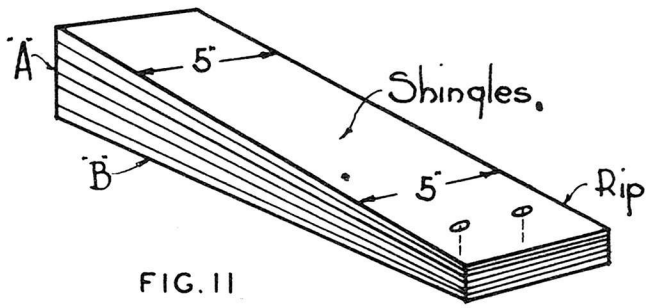


FIG. 11

SHINGLES ASSEMBLED FOR CUTTING

progress up the roof. The shingles that overlap the hip are cut to a special shape so that they fit against the edges of the regular courses of shingles. The cut shingle is shown at A, Fig. 10.

1. Nail about six shingles together, keeping the butt ends and one edge of each shingle flush as shown at A and B, Fig. 11.

2. Mark the top shingle at the butt and tip ends 5 in. from the flush edge of the shingle. Connect these points with a straight line and rip along this line. See Fig. 11.

3. Lay a steel square across the top shingle so that the distance BC, Fig. 12 will represent the run of the common rafter and the distance BF will represent the rise of the common rafter. Mark the shingle along the outside edges of the square.

4. Adjust the square so that its edges are parallel to the marks on the shingle and so the distance BE, Fig. 12 is equal to the width of the shingle course.

5. Mark the shingle along the outside edges of the square and cut the shingles as shown in Fig. 12.

6. Lay the doubled first course of shingles up to the hip. Cut the tops of these shingles off roughly along the hip line.

7. Nail one of the special cut shingles in the proper position on top of the double course as at A, Fig. 10. Allow the edge of the cut shingle to project over the hip so that it may be shaved off on a line with the opposite side of the roof so that the cut shingle E, Fig. 10 may overlap it.

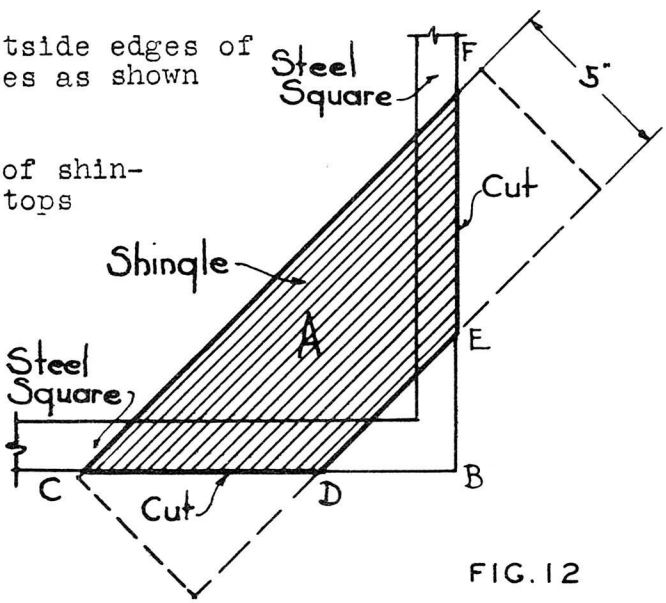


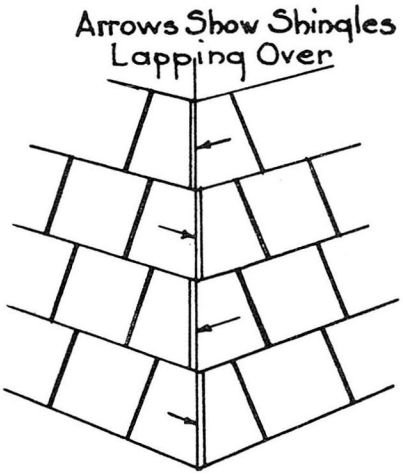
FIG. 12

LAYOUT OF HIP SHINGLE

8. Nail the cut shingle E in the same manner. Shave the edge of this shingle even with the edge of shingle A.

9. Start the second course of shingles by nailing the shingle F, Fig. 10 against the top cut of shingle A. Cut off the top end of shingle F where it overlaps the top of the hip. Continue the regular courses of shingles on both sides of the hip.

10. Nail the succeeding hip shingles over the top of the hip as the shingling progresses up the roof. Be sure to alternate the lap of the hip shingles as shown in Fig. 13.



LAP OF HIP SHINGLES

FIG. 13

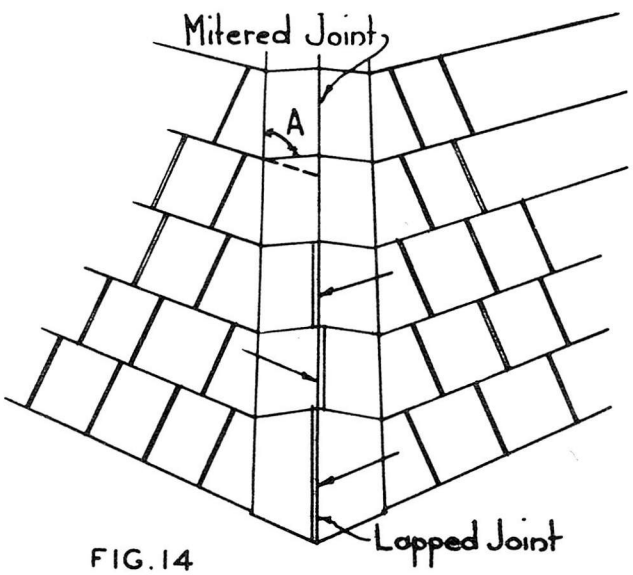


FIG. 14

BOSTON HIP

NOTE: In many cases, special hip shingles are cut. This prevents the top of the shingles from lapping over the hip. See layout of the hip shingle in Fig. 15.

B. BOSTON HIP

NOTE: Figure 14 shows a Boston hip. This hip is shingled in somewhat the same manner as the woven hip.

1. Apply the straight courses of shingles on both sides of the hip.

2. Cut the tops of these shingles off roughly where they project over the edge of the hip.

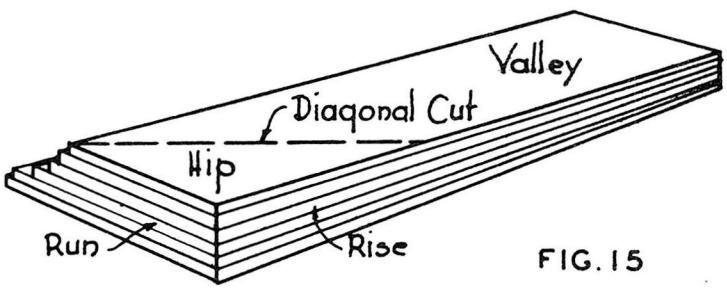


FIG. 15

METHOD OF CUTTING HIP OR VALLEY SHINGLES

They may be random widths. Lay off the diagonal cut as shown, using the rise and run of the common rafter. Cut along this line and apply the shingles on each side of the hip.

3. Lay out and cut the top hip shingles as shown in Fig. 11.

4. Apply these over the top of the regular shingle courses as shown in Fig. 14. Note how they are lapped.

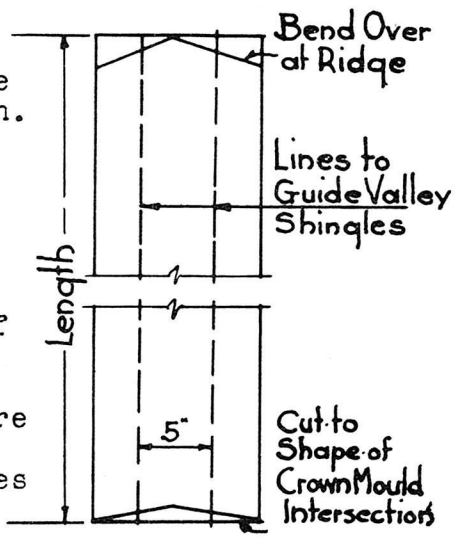
NOTE: Sometimes the hip shingles are mitered instead of being alternately lapped. See Fig. 14.

HOW TO FLASH AND SHINGLE A VALLEY

1. Measure the length of the valley from the crown moulding up to the ridge. Add 6 in. to this length to find the length shown in Fig. 16.

2. Use flashing at least 16 in. wide for a roof pitch of 8 on 12 but increase the width to 20 in. if the pitch is flatter. Mark the center line the entire length of the flashing.

3. Mark the shingle guide lines so that there is about a 5 in. gutter opening at the bottom and a 4 in. space between the lines at the top. See Fig. 16.



VALLEY FLASHING
FIG. 16

4. Cut the bottom of the valley flashing in a V shape so that it will overlap the top of the crown moulding.

5. Bend the flashing with a straightedge along the center line, in a V shape so that it will lie flat on the roof on each side of the valley.

CAUTION: Be sure the soldered joint is face up and that the seams are turned so that the lap is facing down toward the crown moulding. If tin flashing is used, be sure it is painted with two coats of red lead on each side.

6. Nail the flashing in place. Place the nails $\frac{1}{2}$ in. from the edge of the flashing and about 3 ft. apart.

7. Bend the top edges over the ridge.

8. Place a cut valley shingle at each side of the valley with the smooth edge along the shingle guide line on the flashing and the point of the shingle about 4 in. below the crown moulding. Valley shingles are cut as shown in Fig. 15.

9. Place a regular shingle (B,Fig.17) against the valley shingle with the butt 1¼ in. below the crown moulding and nail it in place. Finish this course.

10. Place another valley shingle on top of the first valley shingle, this time keeping the point of the shingle at the same height as the butt of the square shingle B.

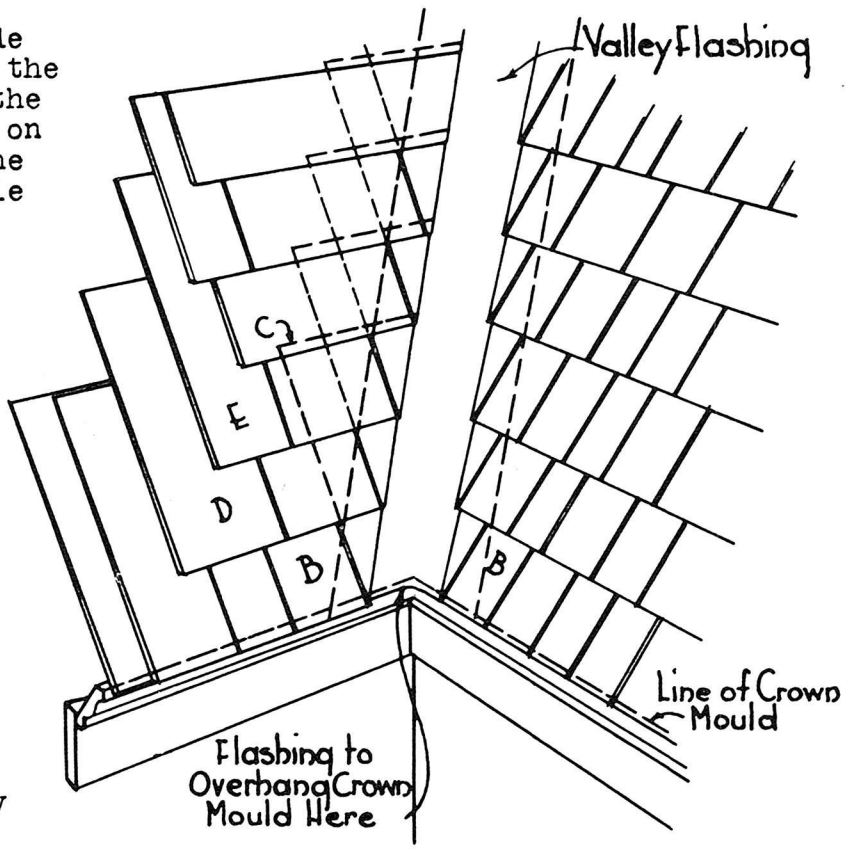


FIG. 17

VALLEY SHINGLES AND FLASHING IN PLACE

11. Continue this double course of shingles, placing the regular shingle against the valley shingle.

12. Cut off the tip of the bottom valley shingle in line with the butt of shingle B, Fig. 17.

13. Repeat steps 8-12 on the other side of the valley.

14. Continue the regular courses of shingles as shown at D and E.

NOTE: If a closed shingle valley is desired, the simplest and most satisfactory way is to bring the opposing cut valley shingles together at the center of the flashing and to lap them.

HOW TO FLASH INTERSECTIONS

NOTE: Figure 18 shows the method of flashing a chimney. If the masonry is not in place, cut the flashing long enough so that it will extend up the wall of the chimney at least 6 in.

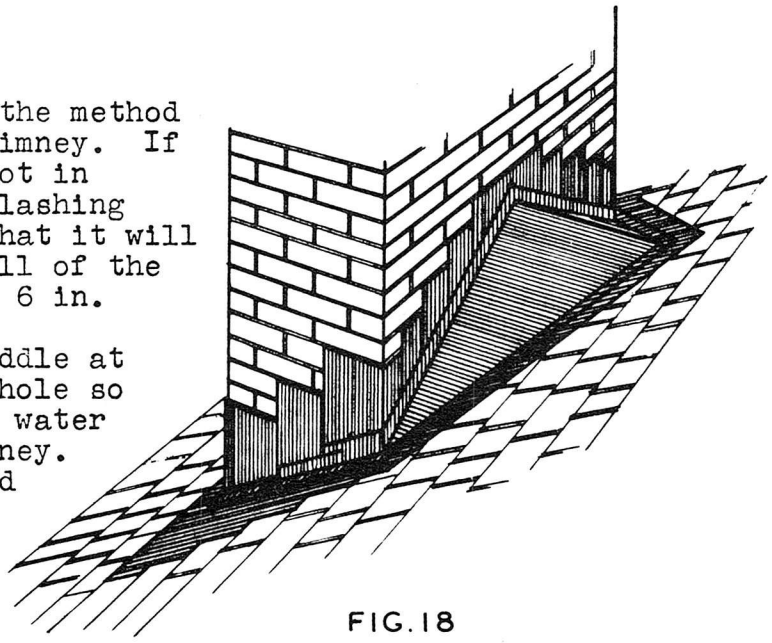


FIG. 18

CHIMNEY CRICKET

1. Build the cricket or saddle at the top of the chimney hole so that it will divert the water to the side of the chimney. The saddle should extend 2 in. over each side of the masonry.

2. Cut and bend the flashing to the pitch of the roof as shown in Fig. 18 and insert one piece of flashing in every shingle course. Nail the flashing to the roof surface. Keep the nails back 3 in. from the bend in the flashing.

3. Flash the top of the cricket and other abutting chimney surfaces as shown in Fig. 18. The flashing should extend 6 in. up under the shingles after they are applied.

NOTE: Flashings against dormer sides may be cut to 5 in. by 7 in. and inserted in every course in the same manner as in flashing the side of the chimney. Do not nail the flashing to the roof surface, but only to the side of the dormer.

DESCRIPTION OF COMPOSITION ROOF COVERING

OBJECTIVES OF THE UNIT

1. To describe roll roofing material.
2. To describe strip and individual composition shingles.
3. To describe rigid asbestos shingles.
4. To describe canvas roof covering.
5. To explain the characteristics of these roof coverings.

INTRODUCTORY INFORMATION

There are many kinds and shapes of roof covering materials other than the wood shingles that the carpenter is sometimes asked to apply to a frame building.

Such materials as slate, tile and metal roof coverings are generally applied by specialists. Information in regard to these coverings does not concern the carpenter so it will be omitted in this unit.

ROLL TYPE ROOFING

Roll type roofing comes in many weights and surface coverings. Rolls of this material are generally 36 in. wide and contain enough material to cover approximately 108 and 216 square feet of roof surface. The small rolls weigh from 55 to 75 lbs. per square, depending upon the number of plies of felt in the material. The surface covering may be smooth or may be coated with sand, colored crushed flint or small pebbles. In most cases the rolls are coated as a solid pattern but it may be obtained with the coated surface marked to represent the individual or strip asphalt shingle. Each roll contains the required number of flat head nails and cement to thoroughly nail and seal the joints.

CHARACTERISTICS OF THE ROLL TYPE ROOFING

Roll roofing may be laid upon a comparatively flat roof, even if the fall of the roof is as little as $\frac{1}{2}$ in. to the foot providing the roof surface is flat and smooth. This however is not good practice where the total fall of the roof does not exceed 6 in. because the roll roofing will buckle after it is laid. These buckles cause high and low spots on the roof surface which in turn provide pockets in which the water collects.

Roll roofing will expand in summer and contract in winter, thus working itself loose from the roof surface and becoming subject to tearing. The exposed edges of the roofing at the bottom edge and the rake are often the first points to fail in roll roofing because the wind will get under the edges and tear the material.

Roll roofing is generally used on temporary buildings. If it is used on a permanent structure, it must be applied very carefully as the roofing material itself will withstand the elements over the period of only from 5 to 15 years. Poor application will cause a much earlier failure.

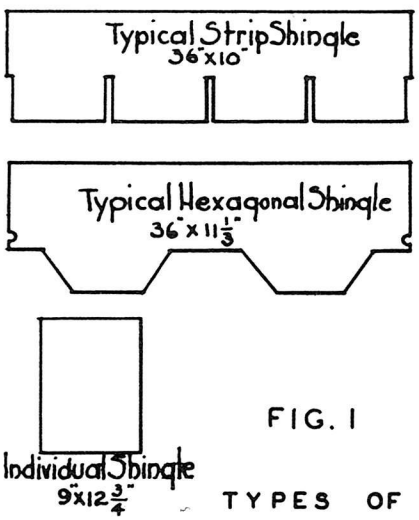


FIG. 1

TYPES OF ASPHALT SHINGLES

STRIP ASPHALT SHINGLES

Strip shingles also come in many weights and styles. The weights range from 75 to 300 lbs. per square and the shingles are packed in two bundles to the square. The surface coverings are in general like those of the roll material. In general, the rectangular shaped shingle comes in strips of from 10 to 16 in. wide and 36 in. long. They are stamped or slotted so as to appear like individual shingles when they are laid. See Fig. 1.

Interlocking strip shingles are made in many shapes, but the hexagon is the one most commonly used because of the ease in which the edges of the shingles may be locked. Individual manufacturers have applied their own distinctive shapes and locking features to this type of shingle. Manufacturers' catalogs should be referred to for further information.

CHARACTERISTICS OF STRIP SHINGLES

Strip and individual asphalt shingles are subject to the same ravages of the sun and wind as the roll type material. However, because this type of shingle is nailed to the roof in smaller sheets than the roll type, there is more allowance for expansion and contraction and as a result, the buckling effect is avoided.

The tearing of this shingle by the wind is prevented by the interlocking devices provided on the better types of these shingles. With this shingle water may be driven by the wind up underneath and over the top of the shingles and onto the sheathing. To prevent this, a water proofed covering should be applied to the entire surface of the roof before the shingles are laid unless the shingle is stiff enough to form a light bond between it and the shingle to which it is nailed.

If neither of these precautions are taken, the shingles should be cemented to each other as they are nailed.

INDIVIDUAL ASPHALT SHINGLE

The individual asphalt shingle is in most cases very similar in composition and weight to the strip shingle. The rectangular shapes often represent as closely as possible the appearance of the wood shingle. The hexagonal and angular shapes have the same locking features as the strip type. This type, especially the rectangular ones are sometimes tapered at the butt. This shingle gives satisfactory service for periods of from 10 to 15 years.

RIGID TYPE ASBESTOS SHINGLE

The rigid type of shingle is composed of asbestos and cement compressed and shaped to sizes corresponding to the individual asphalt and wood shingles. The angular shapes have special locking features. The rectangular shapes are sometimes tapered at the butt and come in random widths. The outer surfaces and edges are left rough to present a rustic weathered appearance. The weight of this type shingle ranges from 650 to 800 lbs. per square but does not, in most cases, require a heavy roof frame to support them. The life of this type roof is from 15 to 40 years. Additional description and information concerning these types of shingles may be found in the reference at the end of this unit.

CHARACTERISTICS OF RIGID ASBESTOS SHINGLES

Asbestos shingles present many advantages as a roof covering in terms of appearance and durability. Water may be driven up underneath them and they should be laid upon roofers felt which covers the entire roof. The roofers felt should be of the quality specified by the manufacturer because this type shingle is brittle and subject to cracking. If the felt is soft it furnishes a cushion for the shingles, thus reducing broken shingles.

CANVAS ROOF COVERING

Canvas is often used to cover flat roof surfaces or porch decks. The material should be close woven cotton duck weighing from 12 to 18 ounces per lineal yard of 27 in. width.

This type of covering is used where the deck surface is to be walked upon, or where rainfall is an annoyance such as on a tin roof.

SELECTED REFERENCES

Audels Carpenters and Builders Guide #4 ..... Graham and Emery
Sweets Architectural Catalog .....

HOW TO APPLY COMPOSITION ROOFING

OBJECTIVES OF THE UNIT

1. To show how to apply roll roofing.
2. To show how to apply strip and individual composition shingles.
3. To show how to apply rigid asbestos shingles.
4. To show how to apply canvas roofing.

INTRODUCTORY INFORMATION

Before composition roofing is applied, the roof surface should be carefully prepared to prevent damage to the roofing. The material should be applied in such a way that the wind cannot get between it and the roof boards. If this happens it might seriously damage the roofing. Expansion and contraction of this type of roofing material often causes difficulty but some precautions may be taken to help overcome this.

TOOLS AND EQUIPMENT

Hammer
Chalk and line
2 in. paint brush
Tin snips
Carpenter's knife
Rule

PROCEDURE

HOW TO PREPARE THE ROOF SURFACE

1. Lay tongue and groove sheathing horizontally on the rafters, starting from the crown mould and proceeding up to the ridge. Do not use sheathing boards wider than 6 in. Use only dry straight sound stock free from large knots. Break the joints on the rafters, staggering them over the surface.
2. Double face nail the sheathing on each rafter with 8d nails. Slant the nails downward so as to draw the boards together, and set the heads of the nails below the surface of the board.
3. After the roof has been covered, inspect the surface to see that there are no projecting nails and that the joints do not form sharp edges which would cut the roofing material.
4. Clean the roof surface of chips and other material.
5. Cover the entire roof surface with a good grade of water proofed building paper or builders felt. If there is a valley in the

roof, the valley strips should be laid before the other roofing material is applied.

HOW TO LAY THE VALLEY STRIP

1. Use a full width strip long enough to reach from the ridge down to and overlapping the crown moulding.

2. Place it in the valley so that an equal amount lies on each side.

3. Push the material down into the valley with a 2 x 4 about 8 ft. long. Nail the edges of the material about every 4 ft. while it is being held down. See Fig. 1.

NOTE: Sometimes the valley is doubled. In this case the upper layer of material should be about 6 in. narrower than the lower strip. This is to taper off the double thickness at the edges so that a ridge will not show when the other covering overlaps the valley strip.

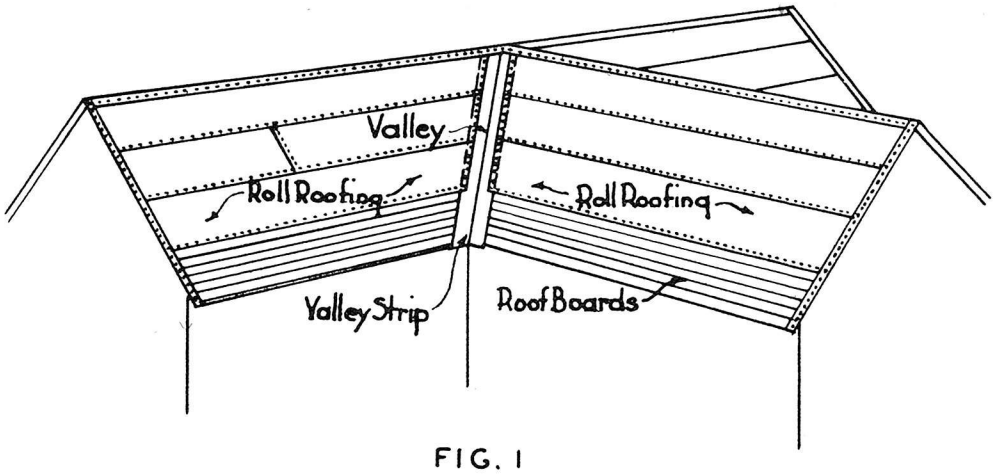


FIG. 1

VALLEY STRIP

HOW TO APPLY ROOFING PARALLEL TO THE RAFTERS

NOTE: On steep roofs the roll roofing is sometimes put on parallel to the rafters. In this position the material is less apt to sag and form wrinkles.

1. Cut lengths of material long enough to reach from the ridge to the crown moulding, allowing about a 4 in. lap at the ridge and 2 in. at the moulding at the eaves.

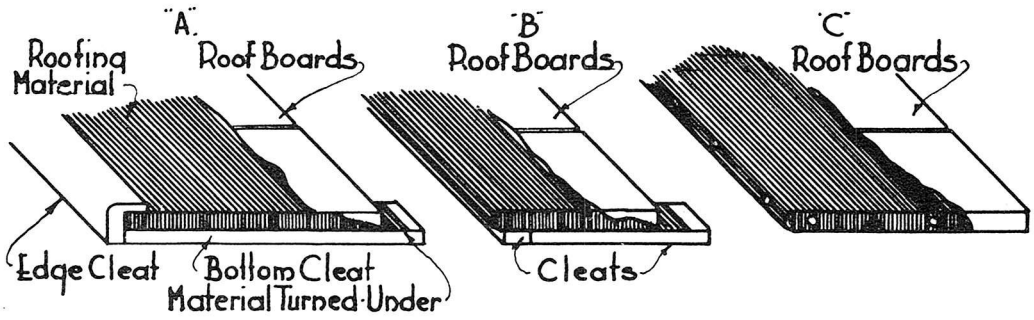


FIG. 2 METHODS OF FASTENING ROOF MATERIAL

2. Starting from the left end of the roof, measure along the roof boards 30 in. at the ridge and at the eaves. Mark these points and snap a chalked line connecting them.

   NOTE: This allows for a 2 in. lap over the end of the roof boards. If there is a valley or any projection on the roof surface such as in shown in Fig. 1, it is advisable to start at the end of the roof to lay the material. However, if the roof surface is unobstructed, it is sometimes advisable to start in the middle of the roof so that the pieces of roofing at each end of the roof will be of equal width.

3. Align the first strip with the chalked line, smooth its surface, and nail it temporarily 1 in. from the ridge.

4. Start at a point half way up to the ridge to turn the roofing material over the edge of the roof boards at the rake.

   NOTE: There are several methods of securing the material over the edges of the roof boards at the rake. This is a point where the wind might tear the roofing so it should be well fastened. The more common methods are shown in Fig. 2.

   If the method A, Fig. 2 is used, the nailing strip will help hold the material in a flat position with no wrinkles, providing it is nailed from the center to the top and from the center to the bottom. This method of nailing should be used regardless of the method of fastening the material.

   NOTE: A convenient scaffold may be made by using a ladder placed up the slope of the roof and provided with a hook so that it may be hooked over the ridge of the roof. An improvised ladder may be made of 2 x 4's and 2 1/2 x 3/4 in. rungs nailed to the 2 x 4's.

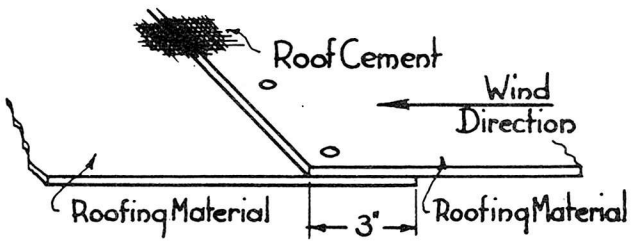


FIG. 3

LAP OF ROLL ROOFING

5. Place the ladder so that the edge of the material which lies along the chalked line may be nailed. Nail this edge about every 2 ft. if the next strip is to overlap it.

   NOTE: The laps should be made so they face away from the prevailing wind. See Fig. 3.

6. If the second strip of roofing is to be lapped by the first strip, snap a chalked line on the full length of the second strip 3 in. from the edge. Paint this edge with roofing cement and slip it under the edge of the first strip, aligning the chalk line with the edge of the first strip.

7. Nail the joints of the roofing material with the nails furnished in each roll. They should be spaced about 3 in. apart and 1 in. from the edge of the material.

   CAUTION: If the roofing material is soft from the heat of the sun, care should be taken not to drive the heads of the nails below the top surface of the material but flush with it.

8. After each seam is nailed it should be coated with roofing cement as shown in Fig. 3. If the flint coated material is used, this painting is not necessary, but the individual nail heads should be covered with a daub of cement.

   NOTE: If joints are to be made in the strips, they should be parallel to the ridge and lapped 3 in., cemented and nailed like the other joints in the material.

HOW TO LAY ROLL ROOFING PARALLEL TO THE RIDGE

1. Prepare the roof surface as previously explained.

2. Lay the valley strip as previously explained.

3. Spike 2 x 4's the full length of the roof and 30 in. apart as shown in Fig. 4.

   NOTE: The first strip should be started at the ridge and lapped at the ridge with the wind. See Fig. 5. If the first

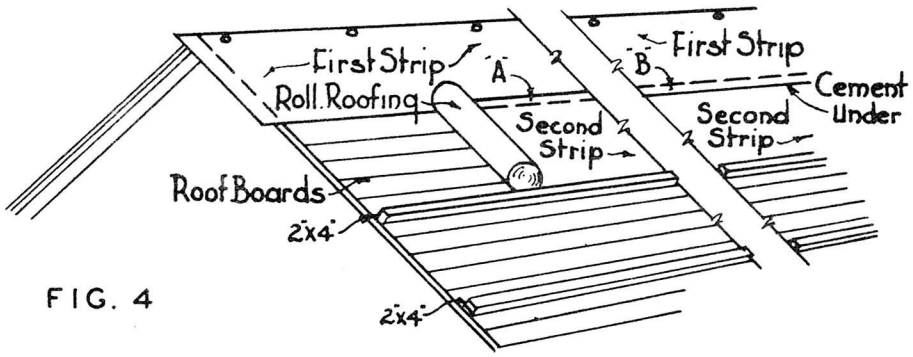


FIG. 4

APPLICATION OF FIRST AND SECOND STRIPS

strip is laid on the leeward side of the roof the bottom edge should be 36 in. from the top of the ridge. If the first strip is laid on the windward side the bottom edge should be approximately 33 in. from the ridge. Assume that the first strip is to be on the leeward side.

4. Snap a chalked line parallel to the ridge and 36 in. from it.

5. Nail the top edge of the first strip along the ridge so that the bottom edge is in line with the chalked line. Space the nails about 2 ft. apart.

6. Roll the second strip into position as shown in Fig. 4.

7. Snap a chalked line 3 in. from the top edge of the second strip. Cover this border with cement, being careful not to cover the chalked line.

NOTE: If the distance from the ridge to the eaves is such that the last strip will be narrower than the others, use a wider lap than 3 in. to make the exposed width of each strip the same.

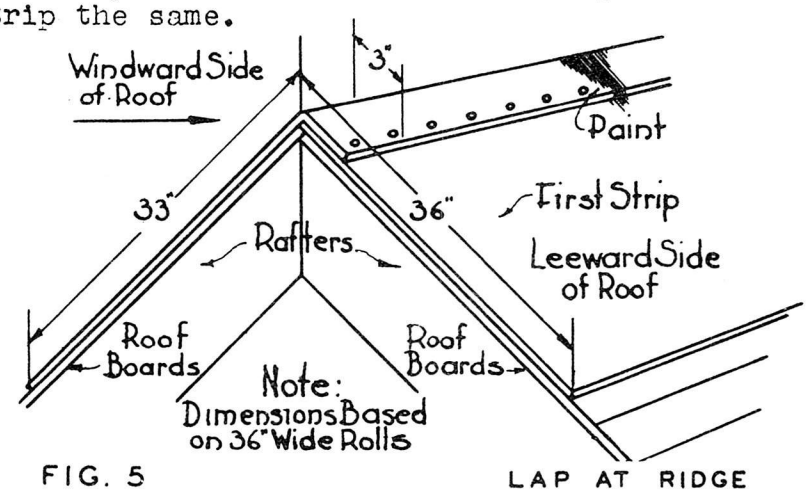


FIG. 5 LAP AT RIDGE

8. Slip the second strip under the first and line up the chalked line with the bottom edge of the first strip. Nail the first strip at the bottom edge, beginning at the center and working toward the ends. Nail and paint as explained for roofing parallel to the rafters.

9. If joints are to be made in the strips, they should be made so that they lap with the wind. They should be squared, painted and nailed the same as the other seams. See Fig. 1.

10. Continue laying the strips down the roof until the eaves are reached. Fasten the material at the ends and bottom edge as previously described.

11. Lay the top strip on the other side of the roof in the manner shown in Fig. 5.

12. Complete this side of the roof.

HOW TO FLASH A CHIMNEY

NOTE: In laying good grades of roll roofing, the chimney and all other intersections with the roof surface should be flashed with metal the same as a shingle roof. However, if roofing material is used for this purpose, there should be a cant strip of wood placed at all intersecting surfaces. See Fig. 6.

1. Cut the roofing material so that it will fold up 4 in. against the chimney surface.

2. Cut and install the flashing cant strip. Nail it in position and set the nails. Round off any sharp edges that might damage the roofing material. See Fig. 6.

3. Build a cricket or saddle at the top side of the chimney and cover it with flashing and roofing material. Cement all joints on the upper and lower surfaces.

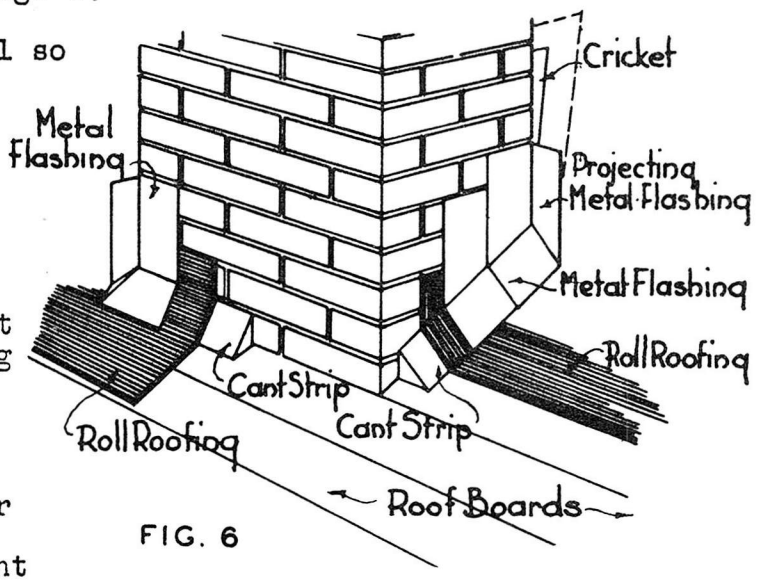


FIG. 6

METHOD OF FLASHING CHIMNEY WITH ROLL ROOFING AND METAL FLASHING

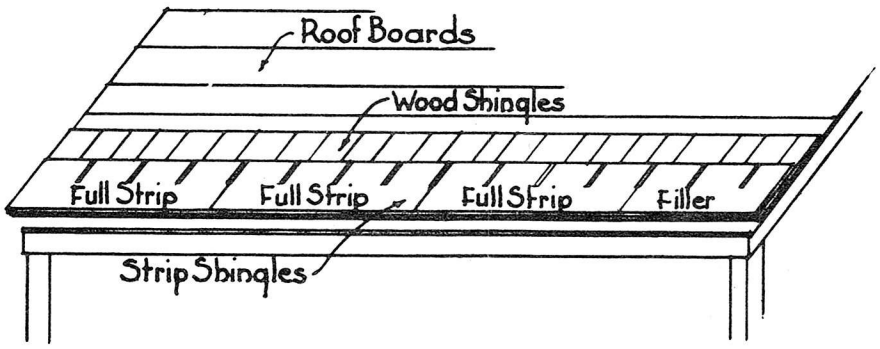


FIG. 7

STRIP SHINGLES - SLOTTED TYPE

HOW TO APPLY STRIP SHINGLES

1. Start at the eaves and lay a single layer of wood shingles as in laying a shingle roof.

2. Lay the strip shingles, if they are not the slotted type, over the course of wooden shingles.

   NOTE: If the shingles are of the slotted type, they should be laid upside down, that is the slotted edge of the shingle should point towards the ridge. This is to avoid having the slots in the composition shingles come over the joints in the first course of wooden shingles. See Fig. 7.

   CAUTION: Be sure to nail the strip shingles at the rake. All nails should be driven into these shingles above the exposed area of the shingle.

3. Start the second layer of strip shingles by using a part of a strip at the rake edge of the roof. The method of cutting the strip is shown at Fig. 8. The part of the full strip to be used as a starter is shown at A. This should be nailed directly over the first layer of strip shingles (the layer that is nailed with the slots up).

   NOTE: Follow the specifications of the shingle manufacturer in regard to the exposure of the shingle.

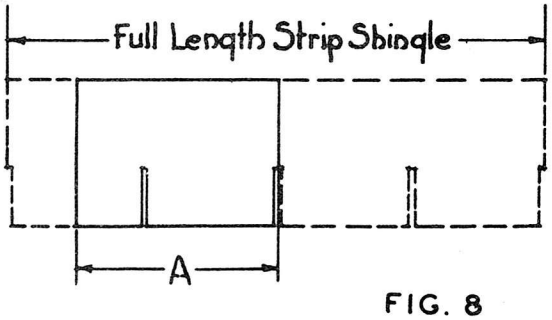


FIG. 8

METHOD OF CUTTING FULL STRIP

4. Continue this layer by using full length strips to the opposite end of the roof. Cut the last shingle to fit over the rake.

5. Start the second course of shingles by using a full strip at the starting end of the roof. Snap a line, if necessary to keep the courses straight.

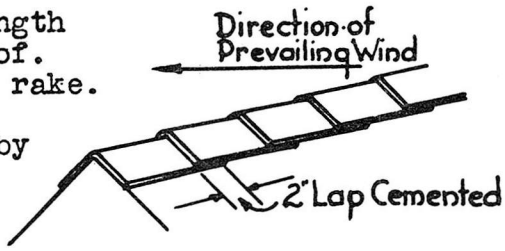


FIG. 9

BOSTON RIDGE WITH COMPOSITION SHINGLES

6. Start every other course with a cut shingle as described in Step 3.

NOTE: If there is a valley in the roof, the valley strip should be painted with roofers dope where the strip shingles overlap the valley roofing.

NOTE: If strip shingles are to be used to cover the ridge, they may be cut so that they may be nailed over the ridge. (Fig. 9). Another method is to cut a continuous strip of roll roofing about 10 in. wide and nail it over the ridge, spacing the nails 3 in. apart. Be sure to make the laps with the wind and cement them thoroughly.

NOTE: If the individual type of composition shingle is used, the same general procedure should be followed. In many cases, where special locking features are provided on the shingles, the directions of the manufacturer of the shingle should be carefully followed.

HOW TO LAY RIGID ASBESTOS SHINGLES

1. Use the best materials for flashing such as copper, zinc or heavy galvanized iron painted on both sides. The nails should be copper or zinc coated and long enough to go through the shingles and three quarters of the way into the roof boards.

2. Lay the shingles about ¼ in. apart and follow the general procedure as outlined for wood shingles.

NOTE: Several different shapes of shingles are on the market and it is impossible to state any definite procedure here that would apply to all. However, the specifications of the manufacturer should be followed.

Special cutting machines may be procured from the manufacturers for cutting the shingles for the hips and valleys.

3. In laying the valley shingles on the valley strip, roofers' cement should be applied to the underside of these shingles where they come in contact with the metal.

4. Protect the roof surface when the shingles are laid by providing scaffolds upon which the workmen may walk on the roof surface without putting a load on the shingles. The mason and plumber should have their roof jobs finished before this type of shingle is laid.

HOW TO LAY CANVAS ROOFING

NOTE: The life of a canvas deck is dependent to a great extent upon the roofing material directly underneath it. Use clear dry tongue and grooved soft pine, spruce or cypress flooring.

1. Toenail and prepare the surface as for composition roofing. If there are any high spots, such as ridges where the boards join together, plane them down so the roof surface is smooth.

CAUTION: Any sharp edges that are covered by the canvas will quickly wear through if the roof surface is to be walked upon.

2. Lay the material across the roof surface. Do not try to stretch it but smooth the wrinkles and tack it temporarily in place with copper tacks.

3. Work from the center of each strip toward the ends, laying the successive strips with a 3 in. lap.

4. Cover the surface of the deck, allowing the material to run up the sides of the building at least 6 in.

5. When the surface is covered and free of wrinkles, nail the seams with copper tacks 1/4 in. from the edge of the material and 3/4 in. apart.

6. Prepare the canvas surface by applying a coat of raw linseed oil until the canvas is saturated.

NOTE: Some mechanics prefer to cover the entire surface with calcined plaster of paris or whiting while the oil is still wet. If this procedure is followed, care must be taken to brush the excess plaster of paris off before it hardens. This process hardens the threads of the canvas which counteracts shrinkage and fills the surface to a smooth finish, giving a better wearing surface. The canvas should then be given two coats of paint.

DESCRIPTION OF WINDOW FRAMES

OBJECTIVES OF THE UNIT

1. To describe the types of window frames.
2. To describe the material used in making window frames.
3. To explain the methods of dimensioning window frames.

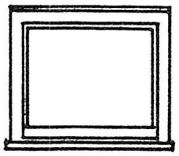
INTRODUCTORY INFORMATION

Window frames may be classified into five general types; single hung, double hung, mullion, transom and semi-circular. These types may be further subdivided into many combinations and styles.

The materials used in the building of window frames should be of standard size. They may be obtained from any lumber mill in case the carpenter wishes to build the frames on the job. However, many mills have ready cut members which may be assembled by the carpenter to make standard size frames.

A knowledge of the sizes and shapes is most essential to the carpenter who has the responsibility of ordering frames, especially when they are to built at the mill.

THE SINGLE HUNG FRAME



SINGLE HUNG WINDOW

FIG. 1

Single hung frames are made to hold a single sash. The sash may be fastened permanently in place or it may swing in or out from either the side or the head jamb. Figure 1 shows the elevation view of this type of frame.

Basement frames are often made of plain plank stock, or regular frame members may be used as shown in the sectional view of a basement frame in place. See Fig. 2. The sill in this case is a pine plank 1 5/8 in. x 5 5/8 in. machined to receive a check strip and sash on the inside edge of the sill, and rabbeted to receive a storm sash or screen on the outside. The side and head jamb members are 1 5/8 in. x 5 5/8 in. stock rabbeted to receive the sash on the inside and the storm sash on the outside.

Casement frames may be made to house single or double sash as shown in Fig. 3. In this case, the sash are hung on hinges attached to the side jambs. The sash rails meet in the middle of the frame and the joint is covered with an astragal strip. Casement frames may be adapted to inswinging or outswinging sash by merely changing the method of fitting the sash and the interior stool at the sill line. Figure 4 shows a casement frame for an outswinging sash while Fig. 5

shows a similar frame for an inswinging sash. Notice the location of the sash in relation to the jamb and sill and also how this type of frame fits into the framework of the building.

Sills for this type of frame are generally pine, cypress or redwood 1 3/4 in. x 7 5/8 in. They are machined to receive either an outswinging (Fig. 4) or an inswinging (Fig.5) sash. The side and head sections (Figs. 4 and 5) show the jambs and how they are machined to receive either the outswinging or inswinging sash. The outside casing on the head section is generally the same as on the side section. This member is 1 3/32 in. x 4 1/2 in. and of the same material as the rest of the frame. The drip cap is generally 1 1/16 in. x 1 5/8 in. and machined to fit underneath the siding and on top of the head casing, thus forming a drip for the water coming off the side of the building. The interior trim members will be described under the heading "Interior Trim", in a later unit.

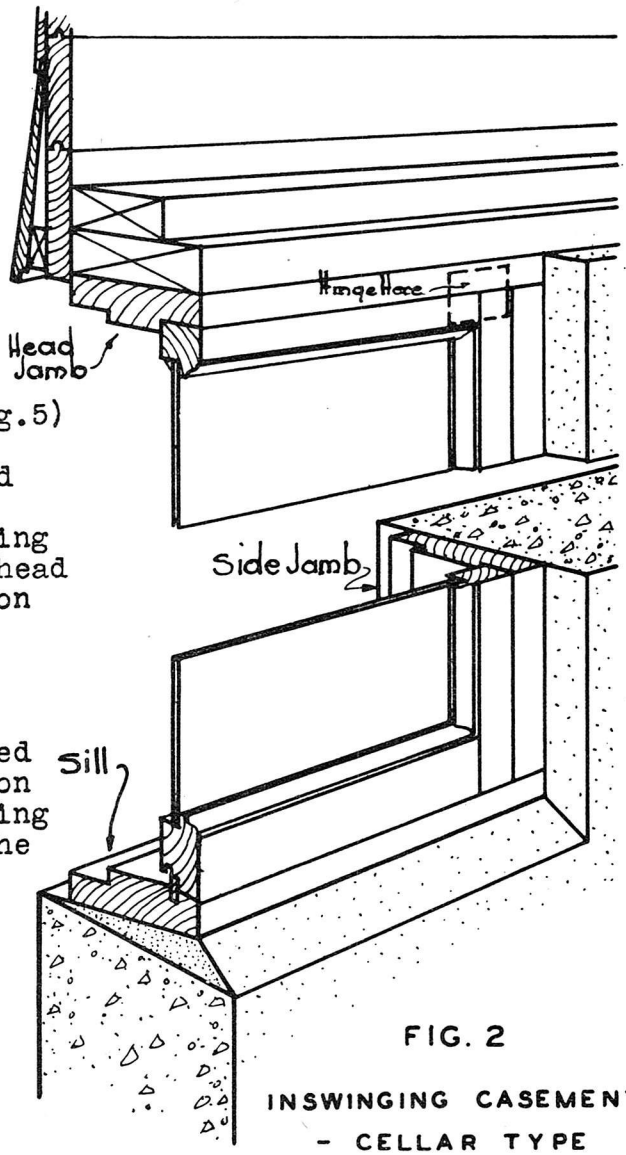


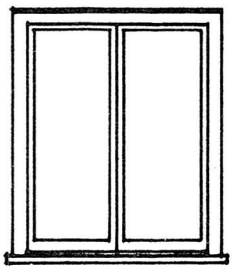
FIG. 2

INSWINGING CASEMENT - CELLAR TYPE

THE DOUBLE HUNG FRAME

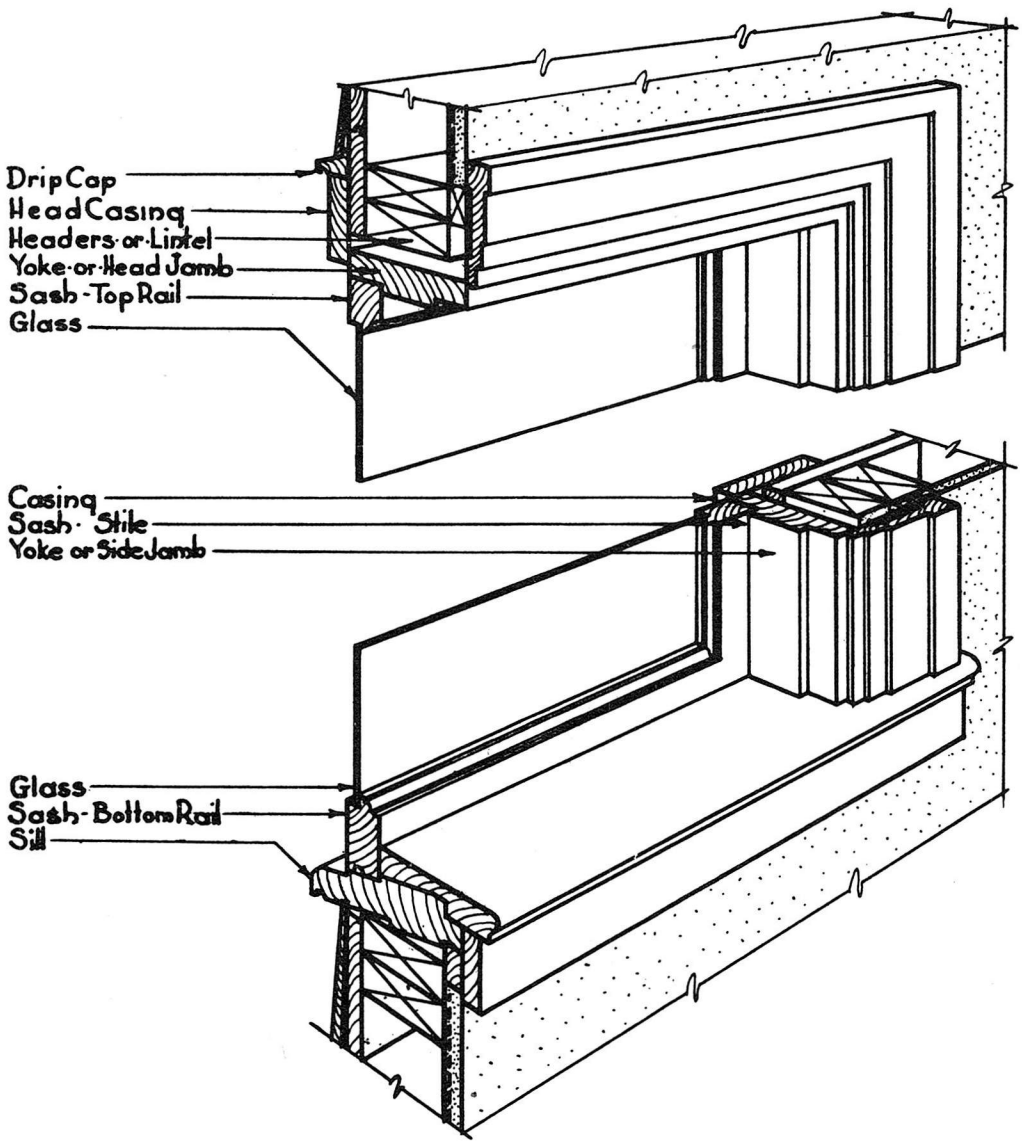
Figures 6 and 7 show a double hung window frame. This frame houses an upper and lower sash which may pass to the top or bottom of the frame by sliding past one another vertically.

FIG. 3



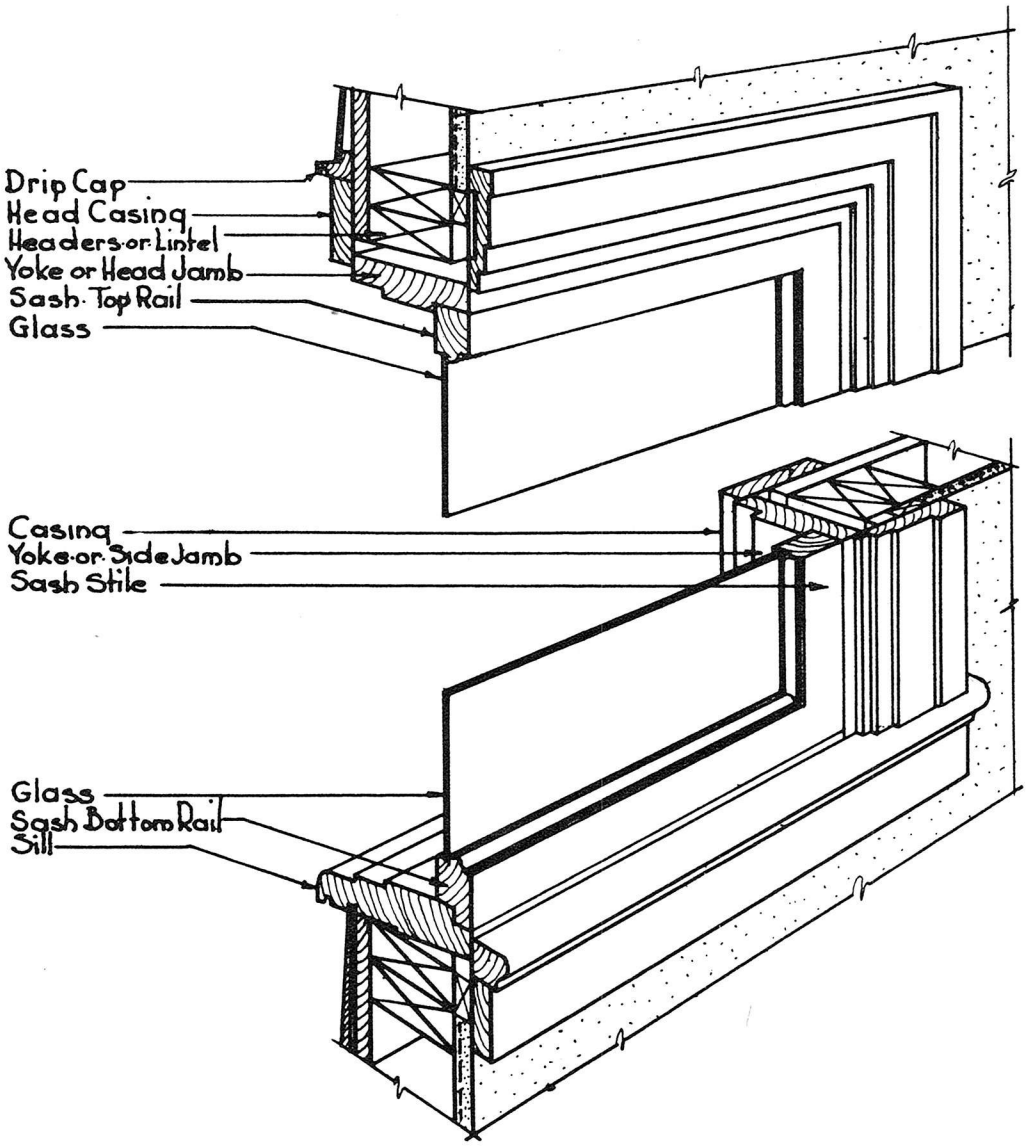
CASEMENT WINDOW

The sill is similar to that of the casement frame except that it is machined to receive the sash in a slightly different way as shown. The side and head jambs or yokes, which are 25/32 in. x 4 7/16 in., are machined to receive a



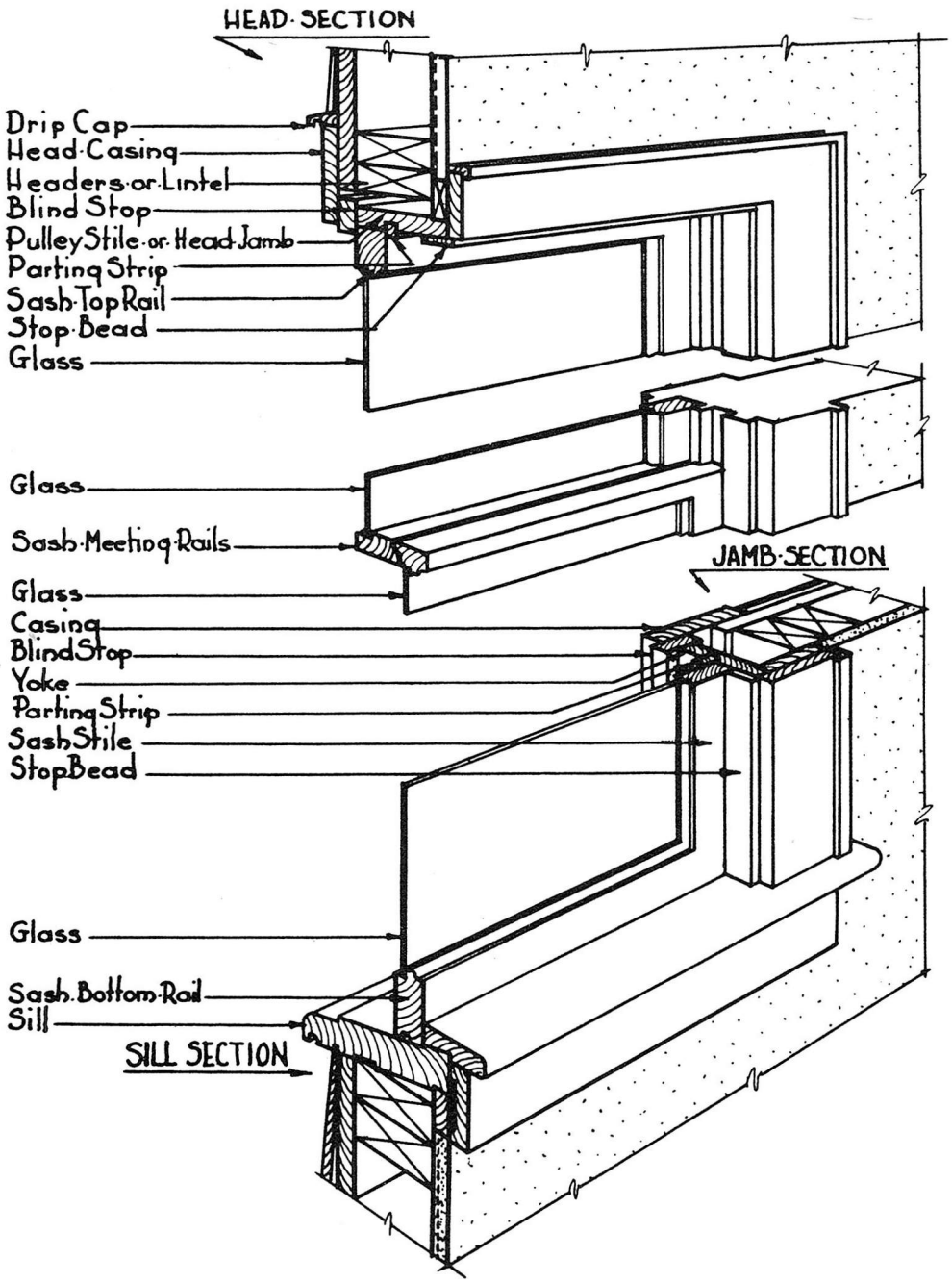
CASEMENT WINDOW - OUTSWINGING

FIG. 4



CASEMENT WINDOW - INSWINGING

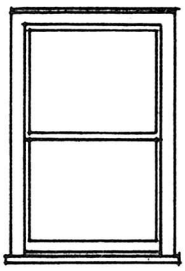
FIG. 5



DOUBLE HUNG WINDOW

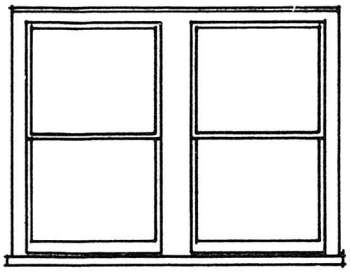
FIG. 6

parting strip 1/2 in. x 1 in. A blind stop 25/32 in. x 1 1/16 in. is nailed on the face of the head and side jambs to form a runway in the jamb for the upper sash. The inner or lower sash rides against the parting strip and the inside stop bead.



DOUBLE HUNG WINDOW
FIG. 7

The runways are provided with a means of balancing the weight of the sash. The most common method of balancing is to provide metal sash weights on each side attached to special cord. This cord is also attached to the edge of the sash and runs over a pulley inserted near the top of the side jambs. This allows the sash to be raised or lowered in the runways and to remain at any desired height. In the double hung window shown in Figs. 6 and 7, provision is made in the side jamb section for a space between the back of the side jamb and the face of the upright 2 x 4's of the rough window opening. This space is called the window pocket and allows the free movement of the sash weights as the sash is raised or lowered.



DOUBLE HUNG WINDOW WITH MULLION
FIG. 8

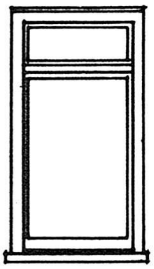
Several patented devices are available for balancing of sash. These may be inserted into the side or head jambs of the frame. It is sometimes necessary to use these devices instead of the round sash weights, especially where narrow interior casings are to be used. There is, however, a flat metal window weight that may be used instead of the circular weight, if narrow trim is to be used on the inside wall. More details on sash balances will be given in the unit "How to Hang Window Sash".

THE MULLION FRAME

Figure 8 shows a double hung single mullion frame. This frame is essentially two double hung frames attached together. Frames of this type may be made in single, double and triple mullion frames. The triple mullion has four openings for double hung sash.

TRANSOM WINDOW FRAMES

The transom window frame is similar to the casement or double hung frame except that a transom bar is inserted to divide the window into two parts. This generally is done when the height of the frame is out of proportion to its width. The upper part is a transom opening in which a small swinging sash may be fitted. See Fig. 9.



CASEMENT AND TRANSOM WINDOW
FIG. 9

In many cases transoms are used for ventilation purposes where the lower window or door is to remain locked to prevent entrance. The upper transom may be left open to provide ventilation.

SEMI-CIRCULAR WINDOW FRAMES

Semi-circular window frames are generally classed as special types of frames. However, most mills have standardized several forms of this type of frame and they may be secured as readily as other frames.

The head jamb of this frame is built up into a semi-circular form (Fig. 10). The side jamb and sill construction of the frame is similar to that of the regular window frame. The right hand section shows the inserted sash. The left hand section shows louvres, which are often used in attics.

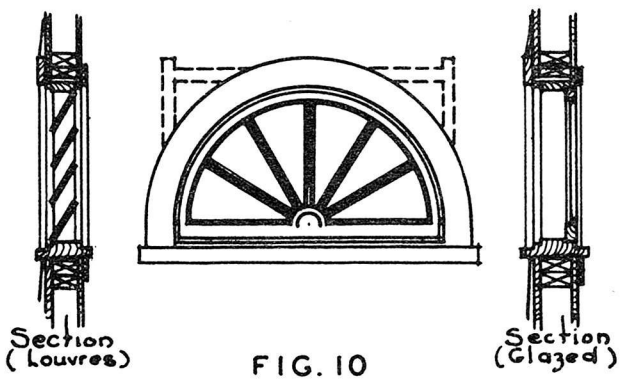


FIG. 10

INSWINGING HALF CIRCLE FRAME AND SASH

SIZE OF WINDOW FRAMES

To determine the size of the opening in a frame for a double hung window, it is necessary to know the number of lights of glass in the window and also the "glass size" (the total width and height of the combined lights of glass).

A double hung window may be specified as a 2 light window. This means that there is one light of glass in the top sash and one in the bottom sash. It might further be specified as 24 in. x 26 in. The width is always stated first. Since the 24 in. is the width of only the light of glass, several more inches must be added to allow for the side stiles of the sash to find the size of the window frame opening. This allowance is known as the wood allowance. The height of the opening would be 26 in. + 26 in. plus a wood allowance for the top, bottom and meeting rails.

In another case, the window might be an 8 light 8 in. x 10 in. double hung sash. This means that there are 4 lights in the upper sash and 4 in the lower sash and that the size of each light is 8 in. x 10 in. The total width of the glass will be 8 in. + 8 in. or 16 in. The wood allowance for a muntin bar and for the two stiles would be added to this to find the width of the opening. The total height of the glass would be 4 x 10 in. or 40 in. The wood allowance for the muntin bars and for the rails would be added to this to find the height of the opening.

The wood allowance to be added to the glass size varies in different sections of the country. However, the following table shows most of these variations.

WINDOW OPENING SIZES

Add the following Wood Allowances to Glass Sizes to determine finished Window Opening Sizes

MARKET	1⅜ and 1¾ 2 Light Wds.		1⅜ and 1¾ 4 Light Wds.		1⅜ and 1¾ 8 Light Wds.	
	Width	Length	Width	Length	Width	Length
Boston	3⅝	5	3⅝	5	3⅝	5
New York	4	6	4	6	4	6
Western	4	6	5	6	5	6
Ohio	4½	6⅛	4½	6⅛	4½	6⅛
Washington	4½	6¼	4½	6¼	4½	6¼
Baltimore	4½	6¼	4½	6¼	4½	6¼
Philadelphia	4⅝	6½	4⅝	6½	4⅝	6½
Indianapolis	5	6½	5	6	5	6
Wilkes-Barre	5	6	5	6	5	6
Southern	5	6	5	6	5	6

MARKET	1⅜ and 1¾ 12 Light Wds.		1⅛ 8 Light Wds.		1⅛ 12 Light Wds.	
	Width	Length	Width	Length	Width	Length
Boston	3⅝	5	3⅝	5	3⅝	5
New York	4	6	4	6	4	6
Western	4½	6	4½	6	4	6
Ohio	4½	6⅛	4½	6⅛	4½	6⅛
Washington	4½	6¼	4½	6¼	4½	6¼
Baltimore	4½	6¼	4½	6¼	4½	6¼
Philadelphia	4⅝	6½	4⅝	6½	4⅝	6½
Indianapolis	4½	6	4½	6	4	6
Wilkes-Barre					5	6
Southern					5	6

According to the above table, a 2 light window ordered in the New York area would have a 4 in. wood allowance added to the width of the glass and a 6 in. wood allowance added to the length. For example, the width of the opening for a 24 in. x 26 in. glass size 2 light window would be 24 in. + 4 in. or 28 in. The height of the opening would be 26 in. + 26 in. + 6 in. or 58 in.

This same window ordered in the Boston area would require an opening, according to the table, of 27 5/8 in. x 57 in.

The sash come with sufficient allowance to permit them to be planed to fit in the frame. The bottom rail of the bottom sash is wide enough to allow it to be beveled to fit the sill without weakening this rail.

SELECTED REFERENCES

A Manual of Standard Construction for Stock Sash, Doors and Frames ..... National Door Manufacturers Association

Good Practice in Construction ..... Knobloch

Building Construction ..... Huntington

Catalogs of sash and doors .....

HOW TO BUILD WINDOW FRAMES

OBJECTIVES OF THE UNIT

1. To show how to build basement window frames.
2. To show how to build casement window frames.
3. To show how to build double hung window frames.

INTRODUCTORY INFORMATION

Some contractors prefer to have the window and door frames built on the job. This procedure provides work for the carpenters during inclement weather. It might save time when waiting for masonry work to be finished or it may avoid waiting for the frames to be delivered from the mill. For this reason, the apprentice carpenter should have a basic knowledge of the construction of a few of the more commonly used frames. However, it is usually more desirable that the frames be manufactured by the mill because of the quality of workmanship and the special features which are impossible for the carpenter to equal unless he has special machinery.

TOOLS AND EQUIPMENT

Fine crosscut saw
Hammer
Jack plane
Block plane
Brace and 3/4 in. bit
Sliding T bevel
Steel and try square
Rule - pencil
Miter box
3/4 in. chisel

HOW TO BUILD AND INSTALL BASEMENT FRAMES

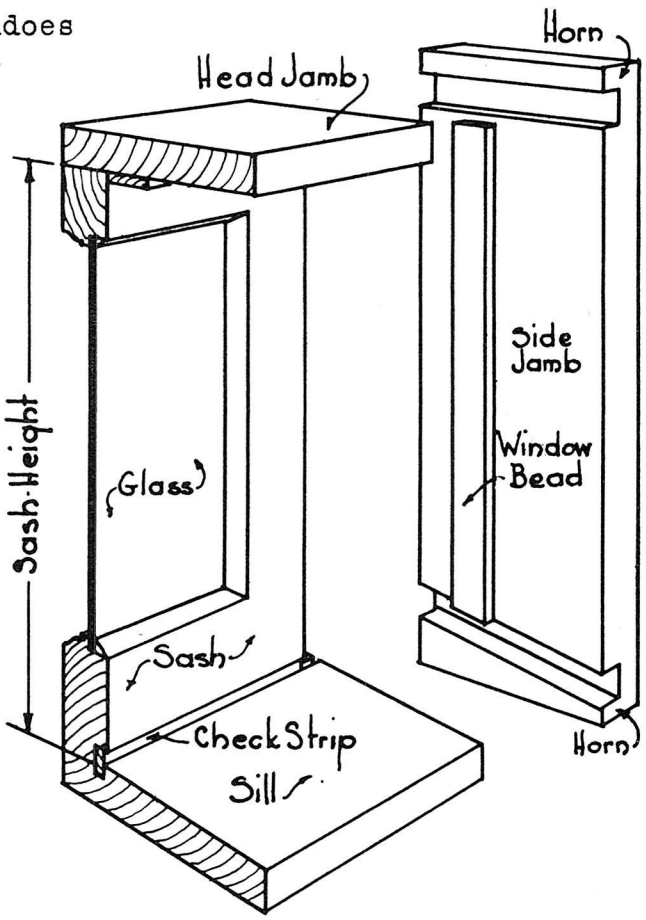
1. Select a piece of pine stock for the sill as described in Unit 1C-T60. It should be 2 in. longer than the width of the required frame.
2. Select material for the side and head jambs of the frame. The head jamb should be the same length as the sill. The side jambs should be about 6 in. longer than the height of the frame.
3. Mark the height of the sash that is to be used in the finished frame on the inside edge of each side jamb (Fig. 1). These points mark the inside lines of the head and sill dado joints. Allow about 3 in. on each end of the jamb to provide for the dado joints and the horns.
4. Lay out the dadoes 1 5/8 in. wide and 3/8 in. deep for the head jamb. These dadoes are square across the jamb.

5. Lay out the points for the dadoes of the same size for the sill on the inside edges of the side jambs. Be sure to lay out one right hand jamb and one left jamb.

6. Mark the sill dadoes across the face of the jambs using the sliding T bevel set at about 8 to 12 degrees. This angle will provide for the pitch of the sill. See Fig. 1.

7. Cut the four dadoes on the two side jambs 3/8 in. deep. and as shown in Fig. 1.

8. Cut the head jamb and sill 7/8 in. longer than the outside width of the sash. This extra length is added to allow the head jamb and sill to be set into the dado joints which are 3/8 in. deep. The additional 1/8 in. permits the completed frame opening to be left 1/8 in. oversize since the sash come considerably larger than necessary. This saves extra planing in fitting the sash into the frame.



CONSTRUCTION OF BASEMENT FRAME

FIG. 1

NOTE: The outside dimensions of sash may be figured as explained in Unit 1C-T60.

HOW TO ASSEMBLE THE FRAME

1. Set the head jamb and sill into the dadoes of the right hand side jamb. Nail through the jambs into the head and sill, keeping the inside edges of the three pieces flush.

2. Set the sill and head jambs into the dadoes of the left hand side jamb and nail as explained in step 1.

3. Square and brace the frame as shown in Fig. 2.

4. Nail strips to the outside of the side jambs to hold the frame in place in the concrete wall.

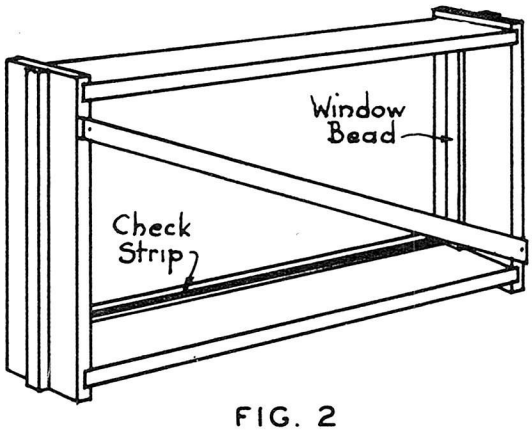


FIG. 2

BRACING A FRAME

NOTE: Sill and jamb stock may be procured from the mill already rabbeted so as to provide a tight joint between the sash and the frame. If plain jambs and sills are used, a stop bead should be nailed around on the inside of the jambs and sill to provide a recess into which the sash may be fitted. Another method is to rabbet the sill so that a check strip may be inserted into the sill and the bottom rail of the sash rabbeted to fit over the strip. See Fig. 1.

If casings are applied to the outside of the jamb, they should be kept back $\frac{1}{2}$ in. from the face of the jambs to provide a recess for storm windows or screens.

HOW TO INSTALL BASEMENT FRAMES

1. Cut off the top horns of the frame.

2. Brace the frames in position on the masonry wall so that the mason may lay the concrete blocks against the side jambs, and use the frame merely as a form.

NOTE: It is not necessary to plumb and level the frame until after the joist sill plate and joists have been placed on the finished masonry wall. The head jamb may then be nailed flush with the outside edge of the sill plate.

3. Check the frame for squareness and insert wooden wedges between the outside edges of the jambs at the sill line and the ends of the concrete blocks.

4. Plumb the frame both ways and drive the wedges tight so as to hold the frame in position.

NOTE: The mason may then fill the openings between the outside of the jambs and sill surfaces and the ends of the concrete blocks with mortar. If these openings are small, caulking compound will give a satisfactory job.

HOW TO BUILD A SINGLE CASEMENT FRAME

NOTE: Select stock for casement jambs. The side jambs are laid out in the same manner as those of the basement frame except that the side and head jambs of the casement frame are generally 25/32 in. or 1 1/16 in. thick.

1. Lay out the dadoes for the head jamb and sill on the side jambs, making one right hand jamb and one left. The slope of the sill should be from 12 to 15 degrees.

   NOTE: The distance between the top of the sill cut and the bottom of the head jamb cut along the inside edge of the jamb should be equal to the height of the sash that is to be used in the frame. If necessary, allow for the rabbet cut in the jamb, sill and sash bottom rail (Figs. 4 and 5, Unit 1C-T60).

2. Square and cut the head jamb to a length equal to the width of the sash plus an allowance for the head jamb to enter the dadoes in the side jambs.

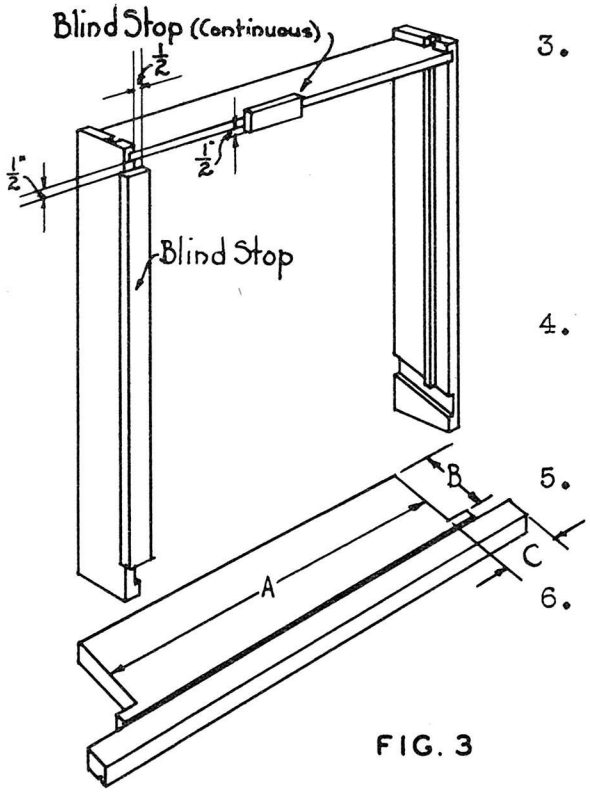


FIG. 3

ASSEMBLY OF CASEMENT FRAME

3. Lay out and cut the sill as shown in Fig. 3. The distance A should be the same as the length of the head jamb. The distance B is the same as the width of the side jamb. The distance C is the width of the casing that is to be used on the window frame.

4. Nail the head jamb into the dadoes in the side jambs as shown in Fig. 3. Use three 8d common nails at each joint.

5. Nail the sill into the sill dadoes of the side jambs. Use three 8d nails.

6. Nail a blind stop on the outside edge of the side jambs as shown in Fig. 3. These blind stops butt onto the top side of the sill. They extend to 1/2 in. below the inside edge of the head jamb and project 1/2 in. over the inside edge of the side jamb. Use 6d common nails and space them about 14 in. apart.

7. Nail a strip of blind stop across the head jamb. Allow it to extend to the outside edges of the blind stops on the side jambs and keep it tight against the top of the side blind stops. This should provide a 1/2 in. margin across the head jamb similar to the margin made in nailing the side blind stops to the side jambs. See Fig. 3.

8. Square the frame at the inside faces of the head and side jambs.

9. Brace the frame to hold it square by nailing a strip about 3/4 in. x 1 5/8 in. to the inside edges of the head and side jamb. If the frames are being built on a bench, the jambs and sill may be temporarily toenailed to the top of the bench to hold them square until after the outside casing has been put on.

   NOTE: The outside casings are cut and applied to the frame in about the same way as the blind stops.

10. Cut bevels on the bottom edge of the side casing material so that it fits against the top of the sill the same as the blind stop.

11. Cut the top edge of the side casing square and to a length which will bring it 1/2 in. above the bottom edge of the head blind stop.

12. Nail the side casing on top of the blind stop, keeping the edge 1/2 in. from the inside edge of the side blind stop. Use 8d casing nails and space them about 12 in. apart.

13. Cut and secure the head casing in a similar manner, allowing it to extend to the outside edges of the side casings. Be sure the cuts on the ends of the top casing are square and that they line up with the outside edges of the side casings.

   NOTE: If only a drip cap is to be used on the top of the frame, it should be the same length as the head casing. If a bed moulding is to be used underneath the drip cap, the drip cap will necessarily have to be wider and longer. Assume that a moulding is to be used.

14. Cut the drip cap to length. It should extend over each end of the head casing the same amount that it extends over the face of the casing.

   EXAMPLE: Assume that the drip cap is to be 2 1/2 in. wide and the head casing 1 1/6 in. thick. The drip cap, when nailed flush with the back of the head casing, would then project over the face of the casing 1 7/16 in.

Therefore in this case, the drip cap should also project over each end of the head casing 1 7/16 in. to provide for the return of the bed moulding.

15. Nail the drip cap with 6d casing nails.

16. Cut and miter the bed moulding across the head casing at the intersection of the drip cap and casing.

NOTE: In putting on the short bed moulding returns, cut a right and left miter on a piece of moulding about 6 in. long. Nail one mitered end to one end of the head casing and cut it off flush with the back of the head casing. Nail the remaining piece to the opposite end of the casing. Use 6d casing nails for the long piece of moulding and 1 1/2 in. brads for the returns.

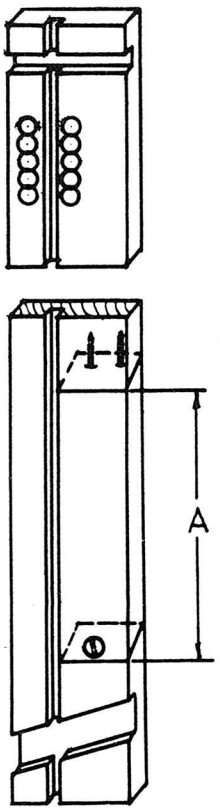
If a bed moulding is not going to be used on the head casing, the drip cap should be cut off flush with the the outside edges of the casing.

HOW TO BUILD A DOUBLE HUNG FRAME

NOTE: Select double hung jamb stock. A double hung frame is made in about the same manner as the casement frame. The type of balances to be used must be determined before the frames are built. If round sash weights are to be used for balancing the sash, a pocket should be provided in the side of each side jamb so as to provide access to the sash weights in case of trouble after the house is plastered and the trim installed. Figure 4 shows one of the more common ways of providing pockets in side jambs.

1. Make a 45 degree miter cut into the side jamb about 8 in. from the sill dado and one about 12 in. above as shown at A, Fig. 4. These cuts should extend to the parting strip rabbet. A cut the length of the pocket should be made along the inside edge of the rabbet. The piece can then be removed from the jamb.

2. Insert two shingle nails at the back of the upper miter cut on the side jamb so that when the pocket is replaced, the nails will hold it tightly against the miter cut.



REMOVABLE POCKET COVER
FIG. 4

3. Insert a 3/4 in. #6 flat head screw on the face of the jamb at the bottom miter cut to firmly hold the loose piece in place on the jamb.

   NOTE: The screw head should be forced below the surface of the piece which may project above the surface at the side jamb. This is usually the case and it should be planed even with the inside jamb surface.

   If spiral or spring balances are to be used these pockets are not necessary.

   If sash pulleys are to be used they should be inserted 3 in. from the head jamb dado and in the center of each sash runway. Some sash pulleys are manufactured to conform to a series of 3/4 in. or 7/8 in. holes and may be inserted in the jamb by drilling holes as shown in Fig. 4 and chiseling out the material.

4. Assemble the remaining members of the frame in the same way as in the casement frame.

HOW TO BUILD MULLION FRAMES

NOTE: When mullion frames are to be built, the processes are the same as for the casement or double hung frame. However, there should be ample room left between the jambs at the mullion so that if sash weights are used on the sash of both window openings, they will not interfere with each other. The sill, head blind stop and outside head casing should be continuous throughout the entire width of the frame so as to give it rigidity and support. See Fig. 8, Unit 1C-T60.

NOTE: Semi-circular and transom frames are usually built at the mill. Because of their infrequent use, a detailed explanation of their make up will be omitted.

DESCRIPTION OF PRE-FABRICATED FRAMES

OBJECTIVES OF THE UNIT

1. To describe the functions of window frames.
2. To describe the methods of flashing window openings.
3. To describe the advantages of using pre-fabricated frames.

INTRODUCTORY INFORMATION

Window frames and glass surfaces are perhaps the chief causes of heat loss through outside walls. This is especially true if the side walls are insulated. Therefore, it is important that both the window frame and the sash be well constructed and that provision be made in the frame for metal weather strips or storm sash or both in order to provide the maximum insulation. The proper flashing around the frame is also an important measure to insure a leakproof wall. These features are often more easily obtained by the use of modern precut window frames.

FUNCTIONS OF WINDOW FRAMES

A window frame should be so constructed that it will prevent rain and cold air from entering the building and heat from filtering out of the building. It should also provide a means by which the sash may be conveniently opened. The sash may be hung on balances or may swing on pivots or hinges. The type of construction between the sash and the frame requires consideration because the joint must be loose enough for the free movement of the sash and at the same time prevent the passage of water and air.

There are two general methods of avoiding the passage of water and air through the joints where the sash and frame meet.

A. Storm windows are perhaps the best means of providing insulation at the window openings because they not only prevent the wind and rain from entering between the sash edges and the frame but they also provide a double thickness of glass with a dead air space between the storm sash and the regular sash. This dead air space acts as a good insulator to prevent heat loss and helps to avoid condensation of moisture on the glass surfaces in cold weather.

B. Metal weather stripping of the sash and window frames does much to prevent air leakage into the building. The disadvantage of using only storm sash as a means of insulation is that they are generally taken off for the summer months and during this time the sash and frame lack protection against the entrance of wind

and rain around the edges. The disadvantage of using only metal weather strips is that there is only a single thickness of glass and there is no insulation as with the storm sash. However, the strips prevent the leakage of air and water both in winter and in summer.

To avoid this leakage at the window frame the year around and to provide adequate insulation, a combination of weather strips and storm sash should be used. In this case, frames should be so constructed that they provide space for weather strips and storm sash.

Window frames and sash are some of the first members of the exterior trim to rot so the material of which they are constructed should be thoroughly painted on all surfaces after they are fitted, or some other means should be taken to treat the wood against rot.

FLASHING WINDOW FRAMES

Before the window frame is set into the opening, the edges of the opening should be flashed, so that the joint between the back of the window casing and the sheathing will be weather-tight. This flashing is generally heavy building paper or felt and should be about 6 in. wide.

Building papers are manufactured of different materials and in various thicknesses. The chief function of a building paper is to prevent moisture or air from passing through to the sheathing. Most building papers come in rolls 36 in. wide and contain 200 to 500 sq. ft. Some papers are coated with rosin or a light coating of creosote and pitch. Some of the felts are soft so when they are forced against the sheathing by the trim they form a flexible covering which is not torn by the shrinking of the sheathing. The hard glazed and tarred papers have a tendency to shrink, thus forming large holes where the nails go through and allowing air to filter into the building.

After the frame is in place, the drip cap should be flashed with a light metal flashing. Sometimes heavy canvas is used for this purpose. This material provides a tight fit when the siding is placed against the drip cap.

PRE-FABRICATED FRAMES

In the pre-fabricated window frame, the jambs, sill, casings and other members are accurately machined and matched together to insure a weather tight joint. In many cases, the lumber is treated with a chemical preservative and moisture repellant to insure long life of the frame. The frames are so constructed that screens and storm sash

may be readily installed. The mechanical features such as pulleys, balances and the necessary hardware are fitted accurately to the frame. The sash are often fitted to their respective frames at the factory, thus saving labor at the job and assuring satisfactory operation of the sash.

There are many types and styles of standard size frames manufacturered today that may be ordered complete with sash fixtures and interior trim, either knocked down or in assembled form. These pre-fabricated frames may be considered more expensive than those made on the job. However, when the quality of workmanship, the material used and time saved are considered, there is not much actual difference in cost.

Pre-fabricated frames should be ordered far enough in advance of the time they are needed on the job to allow the mill to have ample time to build them. This may save much time and may prevent the laying off of carpenters.

SELECTED REFERENCES

One of the best references on pre-fabricated frames is "Sweets Catalog File" in which detailed information has been compiled concerning the products of leading frame manufacturers and the information required in ordering.

HOW TO ASSEMBLE AND INSTALL WINDOW FRAMES

OBJECTIVES OF THE UNIT

1. To show how to assemble pre-fabricated window frames.
2. To show how to install window frames in a building.
3. To show how to flash a window frame.

INTRODUCTORY INFORMATION

The assembly of pre-fabricated frames is similar to that of the frame made on the job but due to the tight joints, certain precautions are necessary.

It is customary to set the window frames so that the head jamb of the window will be on a line with the head jamb of the interior finished door. This may not be possible in every case, especially if there are to be window frames at stair landings or entrance door frames at levels below the main floor. In such cases the type of siding and the method of spacing the courses should be considered so that the top of the frame will come even with the bottom of a course of siding.

TOOLS AND EQUIPMENT

Hammer
Crosscut saw 10 pt.
Rip saw
1¼ in. chisel
Steel square
Spirit level
Window rod
Hand axe
Rule
Straight edge

PROCEDURE

HOW TO ASSEMBLE A PRE-FABRICATED FRAME

NOTE: Most of the modern ready cut frames can be assembled without much trouble but there are occasions when the assembly requires a skilled mechanic. In some cases the manufacturer of the frame supplies specific instructions for assembling. These should be followed. The following instructions apply to this type of frame in general.

1. Assemble the side and head jambs first, being sure the edges at the intersections are perfectly flush. Next assemble the sill to the side jambs. Pull the joints in by using a block and hammer, giving the joints light taps until they are thoroughly seated.

NOTE: It is well to leave the heads of the nails stick out about $\frac{1}{2}$ in. beyond the face of the jambs so that if the frame is not assembled correctly, the nails may easily be withdrawn. After the frame is checked and squared the nails may be driven home.

2. Install the blind stop in the manner explained in Unit 1C-P60. Use 6d casing nails.

3. Square the frame on two diagonally opposite corners and brace the frame in this position.

4. Install the two side casings, being sure the rabbeted joints fit perfectly and that the margin along the edge of the blind stop is the same the full length of the casing. Use 8d casing nails and space them about 14 in. apart.

5. Install the head casing in a similar manner.

6. Install the drip cap and moulding, using the same procedure as explained in Unit 1C-P60.

7. Temporarily tack the parting strip in place in the head and side jambs.

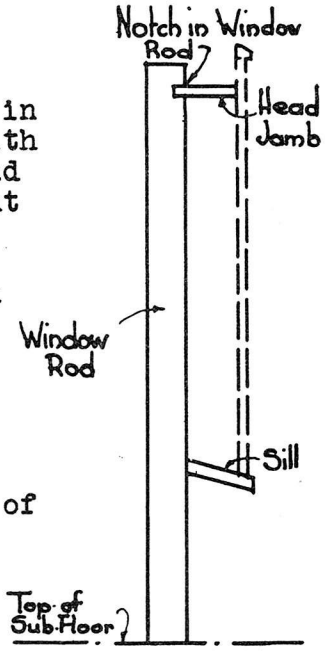
HOW TO INSTALL A WINDOW FRAME

NOTE: It is assumed that the rough opening in the wall is laid out in accordance with the dimensions of the window frame and that provision is made for sash weight pockets if they are needed.

1. Procure the window rod that was used to mark the rough openings of the window frames. Cut a notch so that the head jamb of the window frame will fit into it. This notch should hold the jamb the required distance from the top of the floor. See Fig. 1.

2. Cut off the projecting sheathing at the top of the opening with a hand axe or chisel.

3. Cover the outside edges of the window opening with building paper as shown in Fig. 2. Note the way the paper is lapped at the corners. If the sheathing projects over the sides of the window opening cut it off even with the face of the 2 x 4.



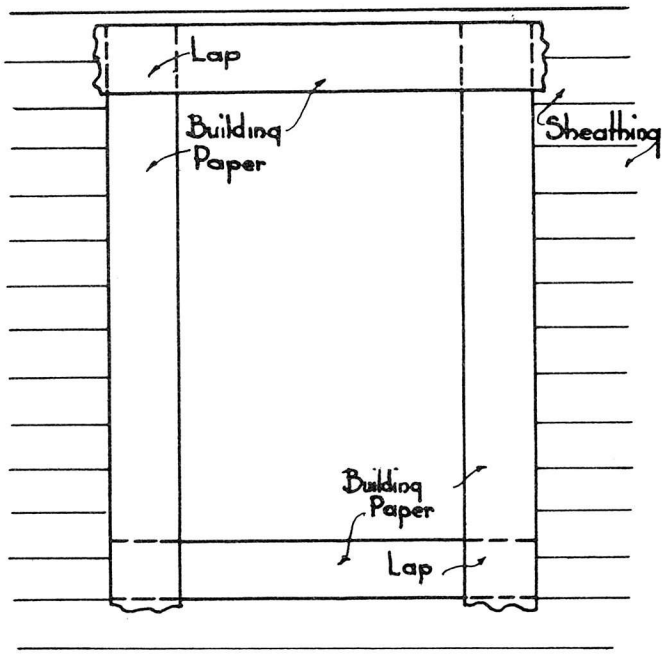
WINDOW ROD HEIGHT
FIG. 1

4. Cut the jamb horns off square so they rest on the 2 x 4 sill.

5. Place the frame into the opening and suspend the head jamb by placing it into the notch of the window rod as shown in Fig. 1.

6. Center the bottom of the frame in the opening at the sill. Temporarily nail the bottom end of one side casing into the sheathing.

7. Level the sill by holding the level first across the inside edge of the sill and then upright against the parting strip of the frame. Use a straight edge and level if the frame is large.



BUILDING PAPER ON WINDOW OPENING

FIG. 2

8. Set a nail in the bottom of the opposite side casing. When the sill is level, temporarily nail the casing to the sheathing.

9. Plumb the side casing by placing the spirit level into the recess of the casing and blind stop. Set a nail at the top of the casing and when the casing is plumb, drive the nail partly into the sheathing.

10. Plumb the opposite side casing, check the sill for levelness again and if it is still level and both casings are plumb, drive the nails home.

11. Finish nailing the side and head casings, spacing the nails about 14 in. apart and opposite the nails that hold the casing to the blind stop. Set all nails.

NOTE: If the side jamb horns of the frame do not rest on the 2 x 4 sill they should be blocked so that the frame has a solid bearing on the rough opening. Care should be used in putting the wedges between the 2 x 4 and the bottom of the jamb so as not to disturb the levelness of the frame sill.

HOW TO FLASH A WINDOW FRAME

1. Cut strips of metal or canvas flashing as long as the drip cap. They should be wide enough to extend from a point 3 in. up the wall down to the drip cap and then out on the drip cap to a point beyond the outside edge of the siding.

2. Mark a line for the bend of the flashing.

3. Place a straight piece of board on this line and bend the metal up.

4. Place the metal on the drip cap. Press it down firmly and nail it to the sheathing with shingle nails.

   NOTE: It is only necessary to nail the metal to the building enough to hold it into place since the siding will be placed over it.

5. Nail the flashing to the top of the drip cap with ½ in. brads spaced about 6 in. apart.

TYPES OF DOOR FRAMES

OBJECTIVES OF THE UNIT

1. To describe a single door frame.
2. To describe a side light and a transom door frame.
3. To describe standard sizes of door frames.
4. To describe door frame flashings.

INTRODUCTORY INFORMATION

The main entrance to a house is often the most prominent feature of the exterior trim. In some types of architecture, such as the Colonial, the finish of the building is quite simple while the design of the principal doorway may be quite elaborate. A door frame may be composed of a single door opening or, if a more elaborate frame is desired, a transom and side window lights may be built into the frame.

MATERIALS USED FOR DOOR FRAMES

The materials used for door frames are similar to those used for window frames. The side and head casings are similar but in most cases the sills are hard wood because of the wear they receive. The side and head jambs are generally made of 1 5/16 in. stock rabbeted to receive the thickness of the door.

The dimensions of the members of a door frame vary to a considerable extent but a typical frame is shown in Fig. 1.

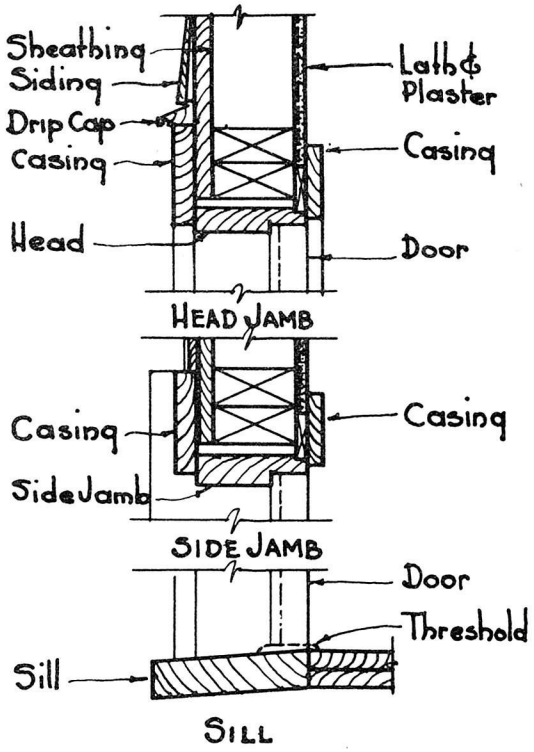
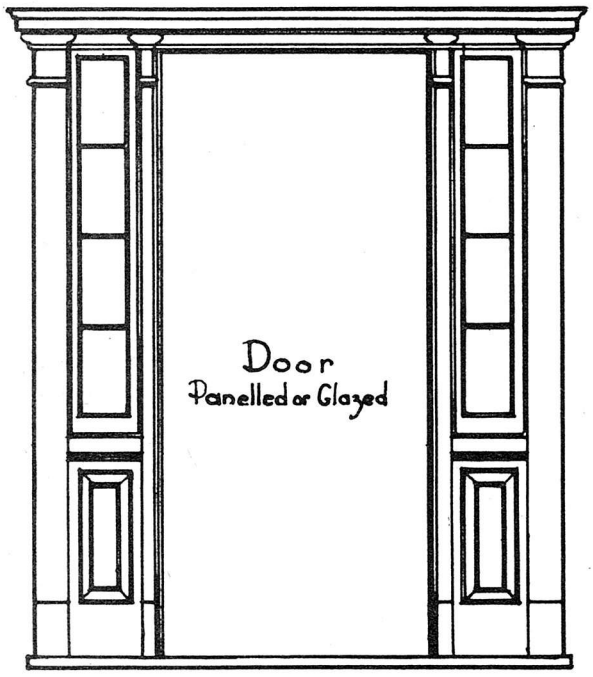


FIG. 1 DOOR FRAME

SIDE LIGHT AND TRANSOM FRAMES

Figure 2 shows a door frame with side lights. The general make up of the frame is similar to that of the single frame with the addition of the side window units which extend from the head casing about two thirds of the way down the door. The remaining space is made up of a solid panel. In some cases the mullions and side casings are finished to represent a column or



SIDE LIGHT DOORWAY

FIG. 2

pilaster. The head casing is composed of a wide drip cap and built-up fascia to receive the caps of the pilasters. Sometimes, a curved or square transom is included over the door.

STANDARD SIZE DOOR FRAMES

Exterior door frames should be made for standard size doors. The sizes most commonly used for dwellings are as follows. The thickness of all outside doors should be not less than 1 3/4 in.

Width	Height
2 ft. 6 in.	x 6 ft. 6 in.
2 ft. 8 in.	x 6 ft. 8 in.
3 ft. 0 in.	x 6 ft. 8 in.
2 ft. 10 in.	x 6 ft. 10 in.
2 ft. 8 in.	x 7 ft. 0 in.
3 ft. 0 in.	x 7 ft. 0 in.

A detailed description of the styles of interior and exterior doors will be given in the section of this book on interior trim.

DESCRIPTION OF DOOR FLASHINGS

The methods and materials used for flashing window frames are also used to flash door frames. The function of flashing is the same in either case.

SELECTED REFERENCES

A Manual of Standard Construction for Stock Sash, Doors and Frames ..... National Door Manufacturers Association

Good Practice in Construction ..... Knobloch

Building Construction ..... Huntington

Catalogs of sash and doors .....

HOW TO BUILD AND INSTALL DOOR FRAMES

OBJECTIVES OF THE UNIT

1. To show how to build a door frame.
2. To show how to install a door frame.
3. To show how to flash a door frame.

INTRODUCTORY INFORMATION

Door frames, like window frames, may be made on the job or ordered from the mill in pre-fabricated or assembled condition. The construction and installation is very similar to that used in window frames.

TOOLS AND EQUIPMENT

Steel square
10 pt. crosscut saw
Rip saw
Try square
Hand axe
Plane
Hammer
Spirit level
Straight edge
1½ in. firmer chisel

PROCEDURE

HOW TO BUILD A DOOR FRAME

NOTE: A door frame is built in about the same manner as a window frame as explained in Unit 1C-P60. However, the blind stop and the parting strip are omitted in the door frame. The opening between the rabbeted edges of the side and head jambs must be of the proper size to accommodate the door that is to be used in the frame. The door frame is squared and braced in the same manner as the window frame.

In framing the hardwood sill it is well to use a rip saw rather than a chisel when cutting out the end of the sill where the jamb and the casing meet at the sill line. This rip cut should be parallel to the outside edge of the sill.

HOW TO ASSEMBLE PRE-FABRICATED FRAMES

NOTE: The procedures are the same as for a window frame.

HOW TO INSTALL DOOR FRAMES

NOTE: The procedures are the same as for a window frame.

DESCRIPTION OF WATER TABLES, CORNERBOARDS AND BELT COURSES

OBJECTIVES OF THE UNIT

1. To describe materials used in water tables, cornerboards and belt courses.
2. To describe types of water tables.
3. To describe types of cornerboards.
4. To describe types of belt courses.

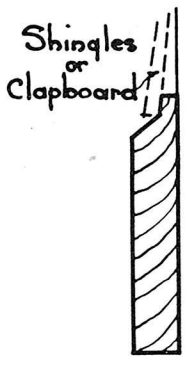
INTRODUCTORY INFORMATION

The exterior trim of a frame building may be plain or quite elaborate, depending upon its architectural style so there are many types and variations of water tables, cornerboards, and belt courses. However, the modern tendency is to simplify these parts of the exterior trim as much as possible.

WATER TABLES

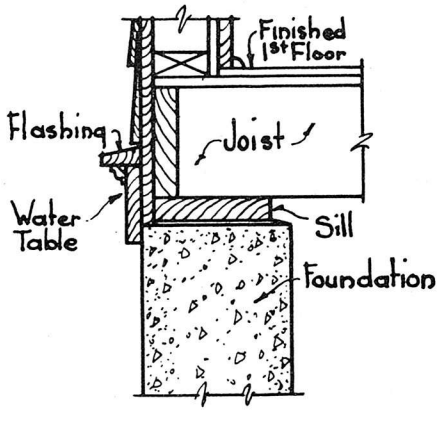
The water table of a frame building is that section of the exterior trim that is immediately below the bottom course of the siding material. Its purpose is to keep the water which drains off the side of the house from running down the face of the masonry wall. It is also used to form a starting point for the siding material and to improve the exterior appearance of the building.

There are two general types of water tables. The single member water table is composed of a solid board, generally 1 1/16 in. x 5 5/8 in. surfaced four sides (S4S) and machined to the cross section shown in Fig. 1. The dotted line shows how the siding fits onto the top of the water table when both are nailed in place on the wall.



SINGLE MEMBER WATER TABLE

FIG. 1



DETAIL SHOWING LOCATION OF WATER TABLE AT SILL

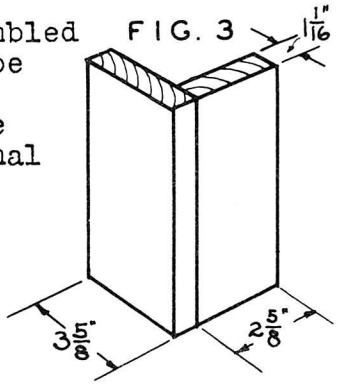
FIG. 2

The built up type of water table may be composed of several members. Generally a board 3/4 in. x 5 5/8 in. (S4S), a drip

cap, and a moulding are assembled as shown in Fig. 2. This type of water table is built up according to the style of the trim and may include additional members.

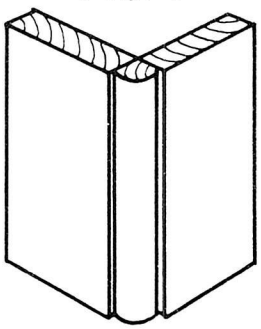
In general, any type of assembled water table should be flashed with metal at the drip cap. There should also be a quirk provided in the underside of the drip cap to prevent water from working into the joints of the assembled water table and cause decay.

FIG. 3



LAPPED CORNER BOARD

FIG. 4

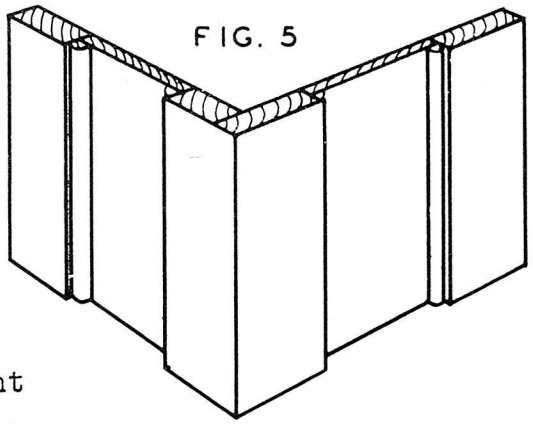


CORNER BOARD WITH QUARTER ROUND

CORNERBOARDS

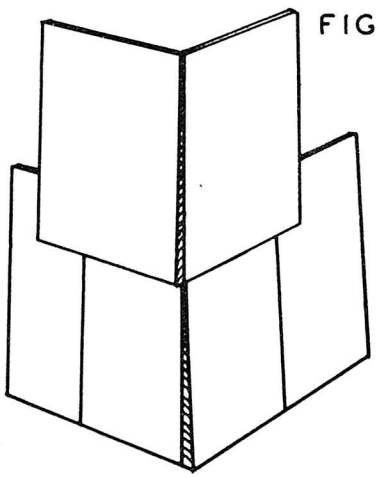
Cornerboards provide protection to the siding material at the corners of the building and form a weather tight ornamental finish. They are used both on external and internal corners of the building. They may be composed of a plain board 1 1/16 in. x 3 5/8 in. on one face of the corner and a plain board 1 1/16 in. x 2 5/8 in. on the adjacent face. This is the most easily constructed type and is shown in Fig. 3.

FIG. 5



PANELLED CORNER BOARD

FIG. 6



SHINGLED EXTERNAL CORNER

Figure 4 shows another method of forming a corner. This type is composed of two cornerboards of the same thickness and width and a quarter round or cove moulding.

Figure 5 shows a more elaborate cornerboard built up of two plain cornerboards spaced about 4 in. apart. A piece of siding is placed in between the boards to form a panel which is trimmed with cove or quarter round moulding.

In some cases the siding material is continuous around the corner and cornerboards are unnecessary. When clapboards are used they may be mitered at the corners and sometimes covered with metal corners.

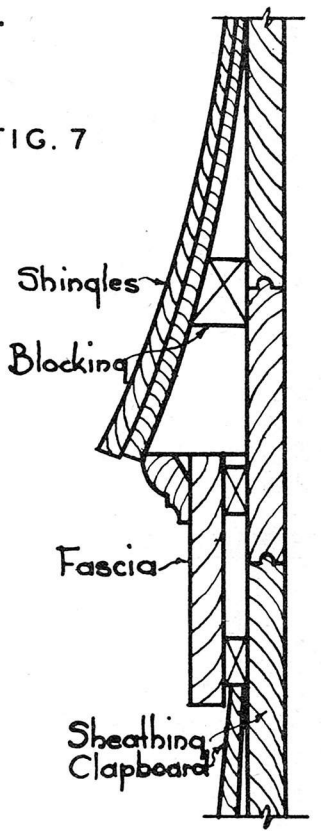
When shingles are used on the walls without cornerboards, they should be lapped at the corners as shown in Fig. 6.

BELT COURSES

A belt course is in general made up the same as a water table. It is really a continuous water table around the building above the first story windows. Its function is to shed water from the walls and also to decorate the side of the building. Belt courses are generally used where the siding material of the lower story is not the same as on the upper section of the wall. Belt courses may be made up of one or of several members. They often consist of a few courses of siding material arranged in a different fashion from the ones above or below.

The water table shown in Fig. 2 may also be used as a belt course. The fascia board may be from 5 5/8 in. to 11 1/2 in. wide. A moulding may be used together with a drip cap of the proper width. This type of belt course should be flashed the same as a water table.

FIG. 7



SWEEP BELT COURSE

Figure 7 shows a belt course with a sweep formed on the siding or shingles by nailing them over the edge of the moulding. In some cases, continuous blocking should be inserted as shown in Fig. 7. In other cases, where a large sweep is desired, it is necessary to cut brackets and to nail sheathing over them to give a firm base on which to nail the siding material. It is important to have a solid base built up if the sweep is more than 1 in. Otherwise the siding material may crack from being forced into place and may cause a leak in the side of the building.

As a general rule, belt courses, cornerboards and water tables are measured by the lineal foot, the plain and moulded surfaces being figured separately.

SELECTED REFERENCES

Carpentry and Joinery Work ..... Burbank
Wood Construction ..... National Committee on Wood Utilization
Architectural Graphic Standards ..... Ramsey and Sleeper
Good Practice in Construction ..... Knobloch

HOW TO APPLY WATER TABLES, CORNERBOARDS AND BELT COURSES

OBJECTIVES OF THE UNIT

1. To show how to apply water tables.
2. To show how to apply cornerboards.
3. To show how to apply belt courses.

INTRODUCTORY INFORMATION

Before outside trim is applied, the sheathing should be fully face nailed and prepared at the corners so that the trim may be placed on a straight and true surface.

Waterproof building paper or felt should cover the entire surface. The laps of the successive layers of paper should point down so if water finds it way behind the siding, it will not drain into the sheathing.

TOOLS AND EQUIPMENT

10 pt. crosscut saw
Rip saw
Try square
Rule
Plane
Chalk line
Spirit level
Hammer
Nail set

PROCEDURE

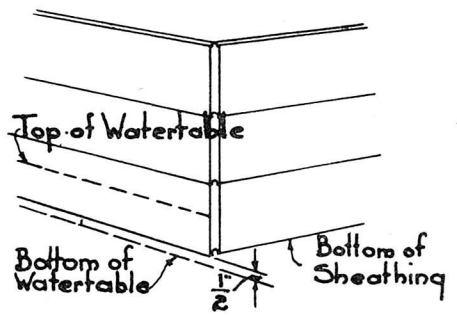
HOW TO APPLY A WATER TABLE

1. Apply a strip of building paper horizontally over the sheathing where the water table and the first courses of siding material are to be placed. Tack it in place using scrap pieces of wood nailed temporarily with shingle nails.

   NOTE: This keeps the paper from tearing loose from the nails.

2. Locate a point on the sheathing at one end of the building to represent the top of the water table. See Fig. 1.

   NOTE: The distance between this point and the bottom edge of the sheathing should be $\frac{1}{2}$ in. less than the width of the



LOCATION OF WATER TABLE
FIG. 1

water table. See Fig. 2. This will permit the water table to extend below the lower edge of the sheathing.

3. Locate a similar point on the opposite end of the building.

4. Snap a chalk line from one point to the other. Check the mark to see that it is level.

5. Temporarily nail the water table so the top is on the line.

6. Miter the water table at the outside corners and butt the joint at the internal corners.

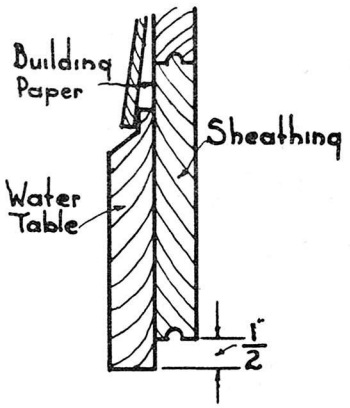


FIG. 2

SECTION OF WATER TABLE

7. Sight along the bottom edge of the water table to note any irregularities. If it is straight, nail the boards permanently in place using two 8d casing or common nails at each stud.

8. Set the nails with a nail set.

9. Apply the water table to the other walls in a like manner.

HOW TO APPLY CORNERBOARDS

1. Cut strips of building paper about 5 ft. long and the full width of the roll.

2. Fold the paper lengthwise down the middle.

3. Apply the paper to all external and internal corners before the cornerboards are placed. Place the fold in the paper vertically on the corner, thus covering the sheathing 18 in. on each side of the corner.

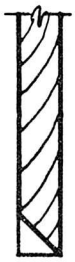


FIG. 3

SIDE VIEW SHOWING CUT

4. Tack the building paper in place using scrap pieces of wood nailed temporarily with shingle nails.

5. Select a straight piece of 1 1/16 in. x 2 5/8 in. cornerboard. Use a piece at least 8 ft. long.

6. Lay out the bottom end as shown in Fig. 3.

7. Cut the board on these marks and fit it over the top of the water table.

8. Temporarily nail the cornerboard flush with the outside edge of the sheathing at the corner of the building (Fig.4).

9. Nail enough additional pieces to extend it up to meet the bottom of the frieze or cornice.

10. Mark the bottom edge of the 1 1/16 in. x 3 5/8 in. cornerboard in a similar manner. However, the bottom cut that fits over the water table does not go through both edges (Fig. 5).

11. Nail this board flush with the outside edge of the narrow cornerboard as shown in Fig. 4 and extend additional pieces up to the frieze.

12. Straighten both boards up and nail them permanently in place using 8d nails spaced about 14 in.

13. Set the nails with a nail set.

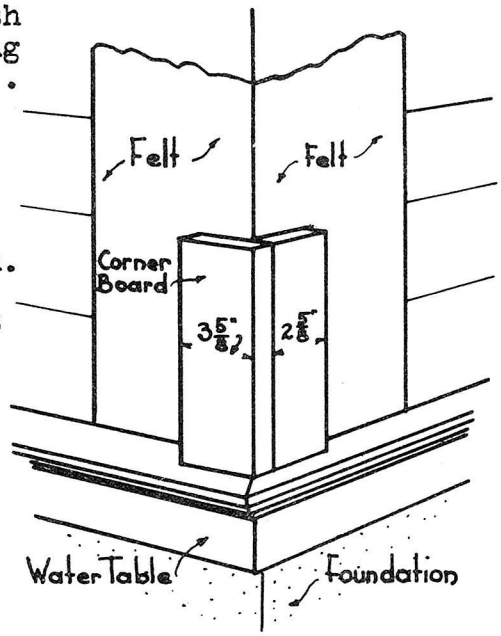


FIG. 4
CORNER BOARD IN PLACE

NOTE: Figure 6 shows how the cornerboard with quarter round or cove moulding is applied. Use cornerboards of the same width on both sides of the corner.

14. Cut the bottom ends of both cornerboards as previously explained.

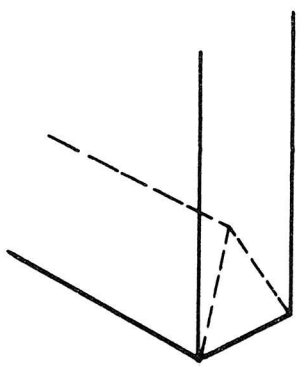


FIG. 5
BOTTOM CUT OF OVERLAPPING CORNER BOARD

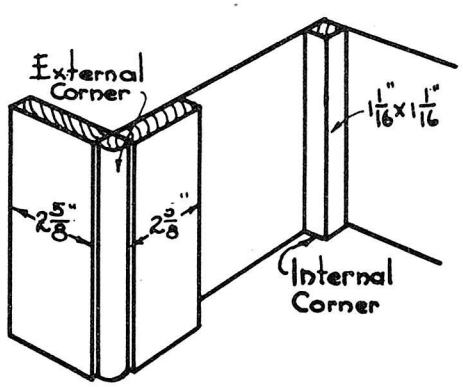


FIG. 6
SHOWING INTERNAL AND EXTERNAL CORNER BOARDS

15. Nail the boards to the both sides of the corner but keep the inside edges flush with the sheathing line.

16. Cut and fit the quarter round or cove so that it fits over the top of the water table.

17. Nail all members in place.

NOTE: Figure 6 shows the method of placing a 1 1/16 in. x 1 1/16 in. cornerboard at the internal corner. The fitting and nailing is similar to that of the other cornerboards.

HOW TO APPLY BELT COURSES

NOTE: A belt course is lined up and applied in about the same way as a water table.

1. Apply the building paper as previously described.

2. Locate the height of the belt course. Snap a chalked line and check for levelness.

3. Tack small blocks of wood at the location of each stud and about 1 1/2 in. above the bottom of the fascia of the belt course (Fig. 7, Unit 1C-T63).

NOTE: These blocks should be the same thickness as the top of the siding material that is to be used back of the belt-course.

4. Tack similar blocks at the location of the top of the fascia.

5. Nail the fascia of the belt course in the same manner as the water table.

6. Nail the bed or crown moulding to the fascia, keeping the top edge of the moulding on a line with the top edge of the fascia.

7. Nail the continuous blocking in place as shown in Fig. 7, Unit 1C-T63.

NOTE: If brackets and sheathing are to be used, nail a bracket at each stud and cover the brackets with sheathing so that the siding will have a firm base to which it can be nailed.

NOTE: If a drip cap belt course is to be used it may be applied exactly as a drip cap water table.

DESCRIPTION OF EXTERIOR SIDE WALL COVERINGS

OBJECTIVES OF THE UNIT

1. To describe bevel and colonial siding.
2. To describe drop, matched and plywood siding.
3. To describe shingle siding.
4. To describe composition siding.
5. To describe methods of estimating exterior wall coverings.

INTRODUCTORY INFORMATION

Several different types of materials are used to cover the outside walls of a building. However, only those materials most commonly used in the construction of dwellings will be considered in this unit.

Wood siding is generally made of white pine, cypress, cedar, fir, or California redwood. These materials are machined into many standard sizes of clapboards, matched siding, and shingles.

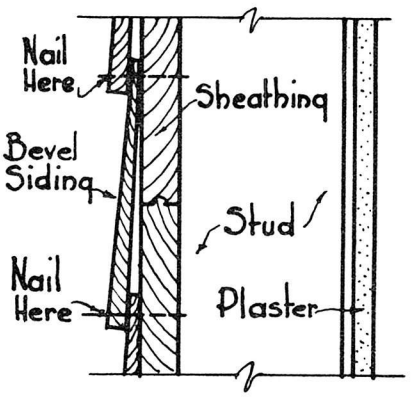
Composition sidings are generally composed of tarred felt or asbestos and are manufactured in shapes and markings to represent wood shingles or brick.

BEVEL SIDING

The plain bevel siding is shown in Fig. 1. The top edge varies from 3/16 in. to 1/2 in. in thickness and the bottom edge from 3/8 in. to 3/4 in. The most common widths are 4,5,6,8 and 10 in. Redwood siding is made as wide as 11 1/2 in. and as thick as 3/4 in. at the lower edge. Most siding comes in bundles of from 4 ft. to 16 ft. in length.

The lower edge of one board overlaps the upper edge of the lower board as shown in Fig. 1. This lap should never be less than 3/4 in. but may vary according to the spacing of the siding.

Nails should be driven through both thicknesses of the siding and into the sheathing and studs. Narrow siding of this type has a tendency to pull apart where it is overlapped between the studs. Wood sheathing should be used on the side walls when this type of siding is used, thereby forming a solid base.



BEVEL SIDING
FIG. 1

If necessary, the siding may then be nailed to the sheathing between the studs. If wide siding of 3/4 in. butt is used, composition sheathing is satisfactory. Rosin coated nails should be used on siding because this coating greatly increases their holding power.

If wide siding is to be used, the type shown in Fig. 2 is quite satisfactory. Some of this type of siding is beveled at the back. This allows the board to lie quite close to the sheathing, thus providing solid nailing.

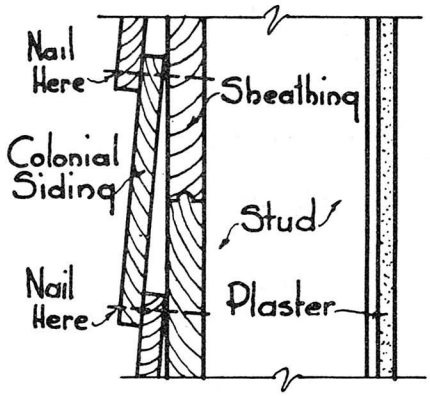


FIG. 2
COLONIAL SIDING

DROP SIDING

Drop siding is generally 3/4 in. or more thick and is matched at the upper and lower edges. Fig. 3 shows one of the common patterns. Drop siding is machined so that the back of the siding has a straight surface, thus allowing it to be nailed directly to the studs without the use of sheathing. This type of edge matched siding might well be used where composition sheathing is used instead of wood. In Fig. 3, the drop siding is nailed on the outside of the studs and sheathing is applied to the inside. This type of construction is often used in garage walls.

Figure 4 shows the ship lap drop siding. This could also be used when it is nailed directly to the wood sheathing. Some forms of siding may be applied to the wall in horizontal or vertical positions, thus giving batten or planked effects to the walls (Fig. 5). Waterproof plywoods are used where large panels decorate the exterior walls.

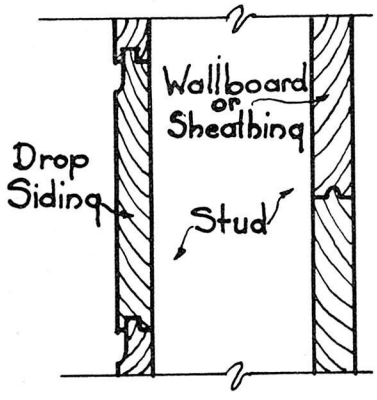


FIG. 3
DROP SIDING

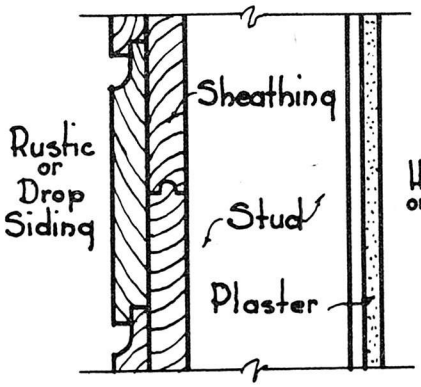


FIG. 4
RUSTIC OR DROP SIDING

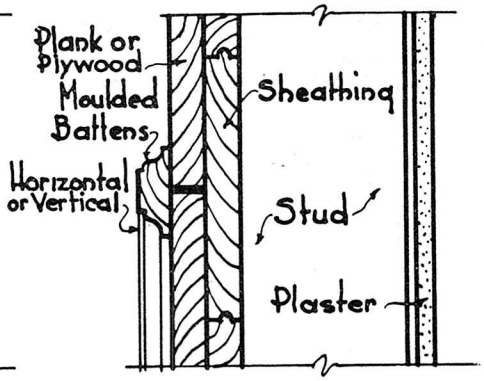


FIG. 5
MOULDED BATTENS

SHINGLE SIDING

Regular shingles are often used as a side wall covering. Hand split shingles are occasionally used but the cost of this type of shingle limits its use. If the sides of a building covered with composition sheathing are to be shingled, it is necessary to apply horizontal strips. The shingles may then be nailed to these strips.

COMPOSITION SIDING

Since composition sidings of different manufacturers vary greatly in size, material and methods of application, the directions of the particular manufacturer should be consulted.

ESTIMATING SIDING

When figuring the surface area of a side to be shingled, only large openings need to be deducted. The method of estimating the number of shingles to cover a given surface was described in Unit 1C-T58.

Clapboards and other types of siding are sold by the square foot. The surface area plus a percentage for lapping and waste will give the amount for that area. Openings are treated the same as in shingling.

NOMINAL WIDTH OF SIDING	EXPOSURE TO WEATHER	ADD FOR LAP AND FITTING
6 in.	5 in.	25%
6 "	4 3/4 "	32%
6 "	4 1/2 "	38%
4 "	2 3/4 "	51%
4 "	2 1/2 "	65%

Plywoods are generally figured by the actual wall surface. The openings are not deducted from this figured area as the opening areas usually balance the waste in cutting.

Manufactured composition shingles are of so many shapes and laps that it is best to refer to the advice given in the manufacturers catalogs.

SELECTED REFERENCES

Building Construction ..... Huntington

House Construction Details ..... Burbank

Wood Construction ..... National Committee for Wood Utilization

HOW TO APPLY EXTERIOR SIDE WALL COVERINGS

OBJECTIVES OF THE UNIT

1. To show how to apply building paper.
2. To show how to apply bevel siding.
3. To show how to apply drop or matched siding.
4. To show how to apply wood shingle siding.
5. To show how to apply composition shingle siding.

INTRODUCTORY INFORMATION

Since side wall coverings must withstand the weather and must not leak, and since they are an important factor in the appearance of the building, they must be correctly applied. A great many sizes and styles of several materials are used for exterior wall coverings. However, the application of only a few of the most common ones will be described in this unit.

TOOLS AND EQUIPMENT

6 ft rule
Hammer
Spirit level
Block plane
Dividers
1½ in. chisel
Pencil
Fine crosscut saw
Chalk and line
Siding hook
Spacing pole
Hatchet

PROCEDURE

HOW TO APPLY BEVEL SIDING WITH CORNERBOARDS

1. Starting at the bottom, apply a full width strip of building paper.

   NOTE: Each strip of paper should lap over the preceding one about 3 in. Tuck the paper up tightly into the grooves under all window frames. Do not cover a large area with paper at one time but apply the strips as the application of the siding progresses.

2. Secure a piece of stock about 3/4 in. x 3 in. and long enough to reach from the bottom of the sheathing to the top of the first floor windows.

3. With one end of this rod 1/2 in. below the bottom edge of the sheathing, mark the location of the bottom of the window sill and of the top of the drip cap (Fig. 1).

4. Mark the spacing of the courses of siding on the rod with dividers.

NOTE: The width of these spacings will be determined by the type of siding and the exposure of each course. The dividers should be adjusted so that the spaces are equal and so that the bottom edge of the siding comes to the sill and to the drip cap of the window. If the spacing below and at the sides of the windows do not come out equal, they should be changed slightly so they appear equal.

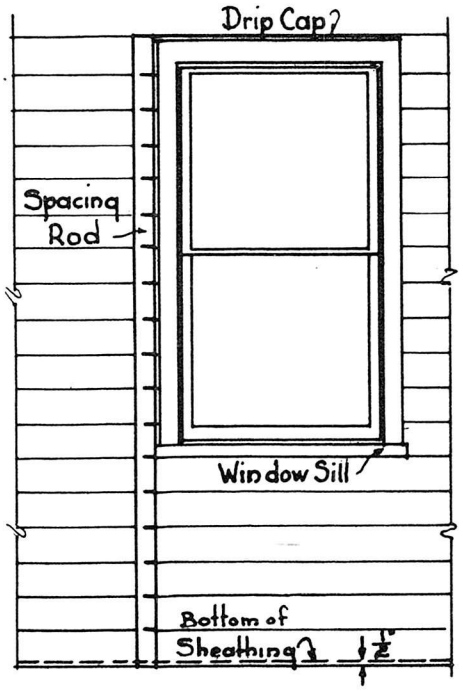


FIG. 1
SPACING SIDING

The position of the courses may be stepped off directly on the building without using a rod. However, this process would then have to be repeated at each side of the building.

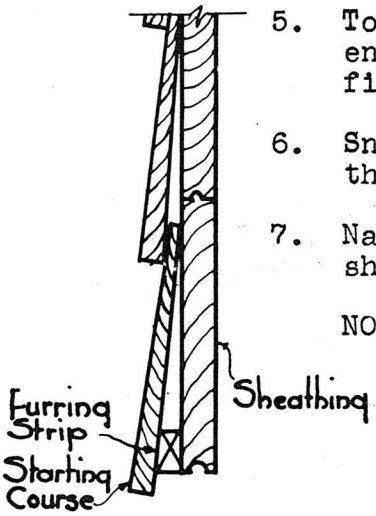


FIG. 2
STARTING SIDING

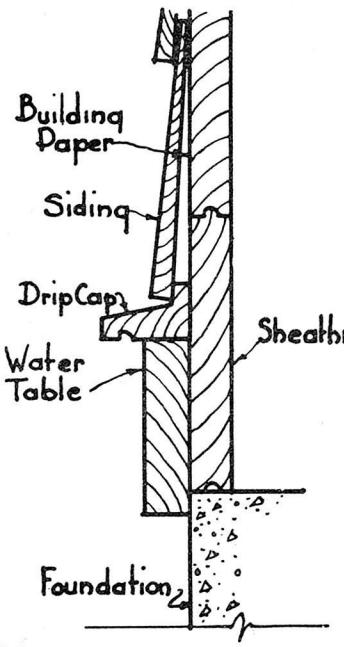
5. To start the first course, make a mark on each end of the building where the top edge of the first course will come.

6. Snap a chalk line between these two marks to show the top edge of the first course.

7. Nail furring strips along the bottom edge of the sheathing (Fig. 2).

NOTE: With 8 in. clapboards, the furring strips are from 1/2 in. to 5/8 in. thick. Plaster grounds may be used for this purpose. The furring is done to flare the first course out at the bottom.

If a water table is used, the procedure will be the same but the first clapboard will set against the water table instead of against the furring strip (Fig. 3).



APPLICATION OF SIDING AT WATER TABLE

FIG. 3

8. Square the ends of the first board and put one end against the left cornerboard with the top edge on the chalk line. Tack the top edge with small nails driven part way in.

9. Continue the siding across in the same manner and fit it to the right cornerboard.

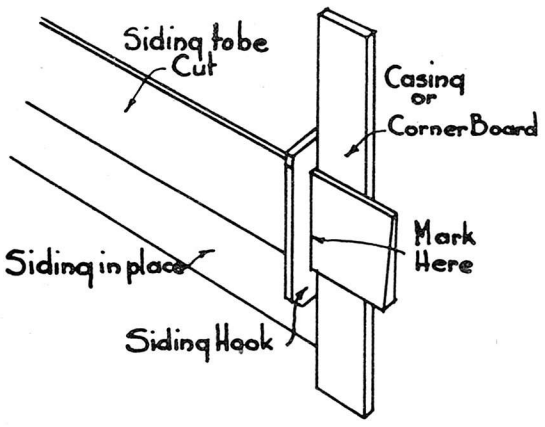
10. Sight across the bottom of the first course and, if satisfactory, nail it in place securely. Nail through the thick part of the board into the furring strip at the bottom.

11. With the spacing rod, mark for the second course, strike a line and continue in the same way.

12. Use a siding hook as shown in Fig. 4 to mark the length of the pieces of siding between the cornerboards or window casings. Be sure the siding is in a level position while the mark is being made.

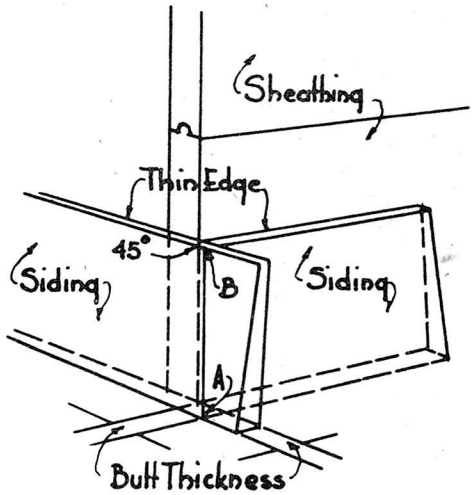
HOW TO APPLY BEVEL SIDING WITH MITERED CORNERS

1. Allow a piece of siding of the first course to project beyond the corner of the building (Fig. 5).



USE OF SIDING HOOK

FIG. 4



MITER CUT OF BEVEL SIDING FOR STARTING COURSE

FIG. 5

Make a mark on the outside face at the bottom of the siding at a distance from the corner of the building equal to the thickness of the bottom edge of the siding (A, Fig. 5).

2. Make a mark at the top of the siding at a distance from the corner of the building equal to the thickness of the top edge of the siding (B, Fig. 5).

3. Connect these points with a straight line on the face of the siding. This gives the long point of the miter cut. Mark a 45 degree angle from this line across the edge of the piece.

4. Cut the board along this line with a fine tooth saw.

5. Mark and cut the siding for the opposite side of the corner in a similar manner and nail both boards in place.

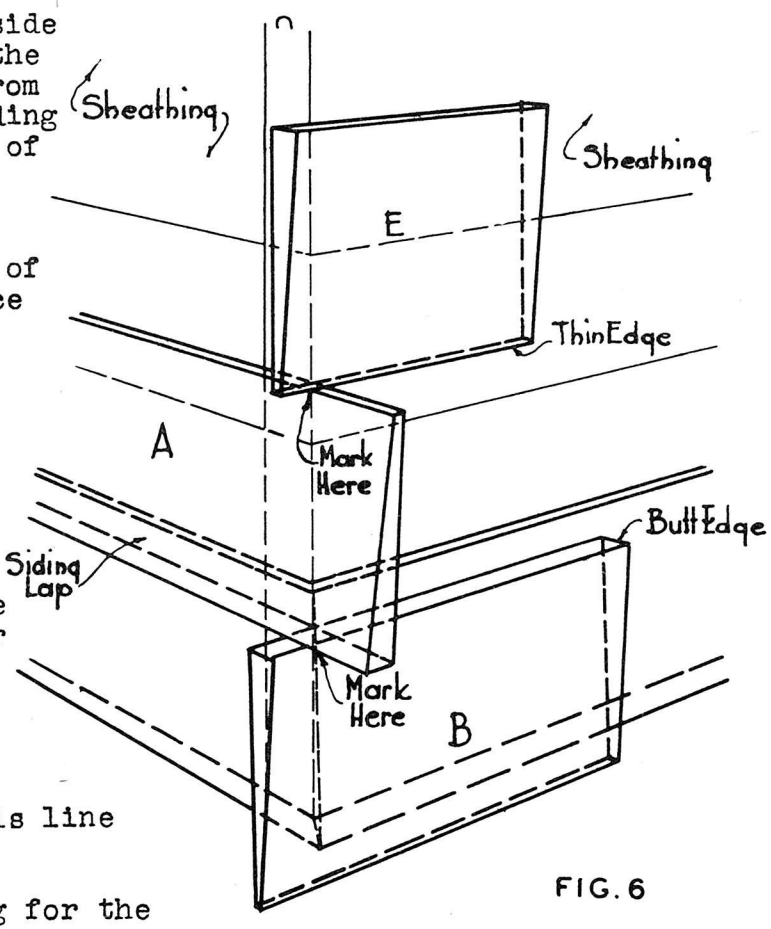


FIG. 6

CUT OF BEVEL FOR SUCCEEDING COURSES

6. Place a board for the next course in position (A, Fig. 6).

7. Place a short piece of siding B underneath the piece A and against the face of the first course in the position shown in Fig. 6.

8. Mark the outside face of piece A opposite the outside edge of piece B.

9. Put the short piece B in the position shown at E with the thin edge down.

10. Mark the top of the outside face of piece A opposite the outside edge of E.

11. Draw the line connecting the two marks, lay out the angle and make the cut as before.

12. Mark and cut the piece for the other side of the corner and for succeeding courses in the same manner. Nail the boards in position as they are cut.

HOW TO APPLY DROP OR MATCHED SIDING

NOTE: This siding is usually applied directly to the studs.

1. Select a straight piece of siding. Start at the bottom of the sheathing and flush with the corner with the tongue up.

2. Cut the piece on the center of a stud and tack it in place with 6d rosin coated common nails driven part way in.

3. Continue across the building, keeping the first board straight and level. Cut the last piece flush with the corner and tack it in place.

4. Sight this course for straightness. If it is straight, nail it firmly in place with two nails at each stud.

5. Continue up the building keeping all matched and butt joints tight.

NOTE: When siding is applied directly to studding, cornerboards should be applied over the siding and finished as described in Unit 1C-P63.

HOW TO APPLY WOOD SHINGLE SIDING

1. Space the shingle courses the same way as described for clapboards.

2. Nail a furring strip around the bottom edge of the building as shown in Fig. 7.

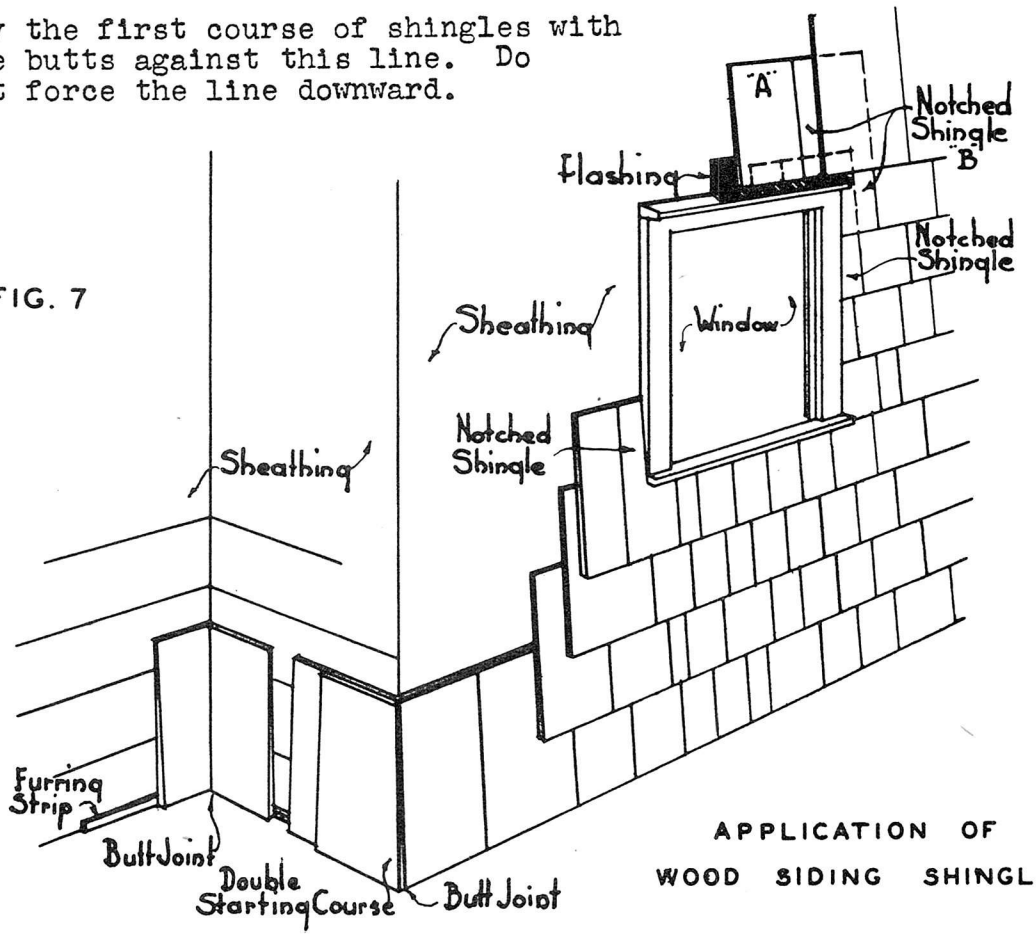
3. Locate the bottom edge of the first course of shingles with the spacing rod.

4. Tack a shingle on both corners and in the middle of the building. Keep the bottom of the shingles level and at the proper height.

5. Drive a small nail into the bottom end of the first shingle and hook a line on this nail. Stretch the line across the building and hook it on the bottom edge of the middle and the opposite corner shingle.

6. Lay the first course of shingles with the butts against this line. Do not force the line downward.

FIG. 7



APPLICATION OF WOOD SIDING SHINGLE

NOTE: Keep the edges of the shingles which butt against one another plumb. Use a spirit level to level the bottom of the shingles of the internal corner with those of the external corner shown in Fig. 7.

7. Lap the shingles at the external and internal corners butting them as shown in Fig. 7.

8. Double the first course of shingles the same as the starting course on a roof. Alternate the lap of the corner shingles.

9. Determine the location of the second course with the layout rod. Snap a chalk line to show the butt line of the second course.

10. Lay the second course of shingles to the chalk line.

11. Lap the corners opposite to the lower course. No joint should occur in any course directly over one in the preceding course. Make the break at least 1¼ in. from the joint below.

12. Apply the third course in the same manner but again reverse the lap at the corners.

NOTE: When fitting shingles around the bottom of windows, do not allow the joints to come directly under the casing edge. If the tips of the shingles run above the window sill, notch them as shown in Fig. 7 so they will slide up into the groove of the sill.

HOW TO PROVIDE FOR SCAFFOLD BRACKETS

1. Run the courses of shingles as shown in Fig. 8, leaving out the shingles where the cleat is to be placed. Break back the shingle joints as shown.

2. Spike the cleat through the sheathing into a stud. If no stud is located at this position, provide one on the inside of the sheathing. Information on the complete erection of scaffolds may be found in Unit 1C-P43 of the book "Framing, Sheathing and Insulation" of this series.

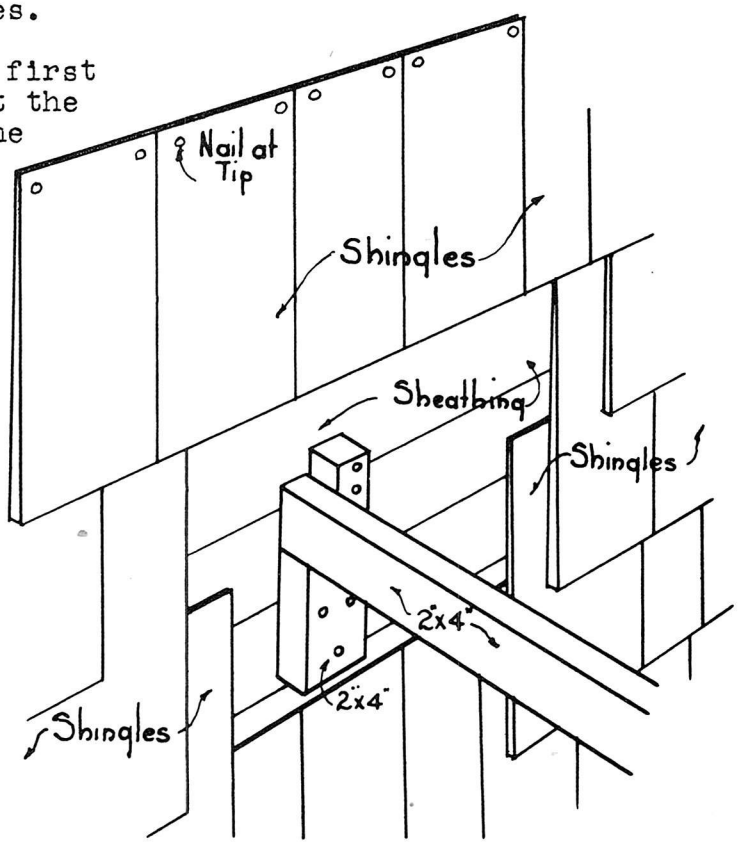
3. Nail the shingles in the first course above the cleat at the tip only, so that when the cleat is removed the shingles may be pushed up under this course and then nailed with small brads.

4. Continue to shingle the side of the building.

HOW TO SHINGLE ABOVE WINDOWS

1. Flash the drip cap (Fig. 7). Notice how the shingle B is cut to fit around the drip cap and how those over the window (A) are cut off at the butts so the tips will line up.

NOTE: If the shingles are cut off at the tips to make them line up, a bulge will be formed in the shingles at this point.



SCAFFOLD BRACKET

FIG. 8

2. Continue the shingles across the tops of all windows in a like manner.

3. Place the course that comes above the window in the same manner as the regular courses.

HOW TO APPLY COMPOSITION SHINGLE SIDING

NOTE: Asbestos shingle siding can only be laid to a uniform spacing according to the type of shingle. Lines are struck for the top edge of the shingles.

Asphalt slate covered siding such as imitation brick are also laid with a uniform spacing although they may be varied slightly up or down.

Asphalt individual shingles are laid in the same manner as wood shingles.

Since there are many types of composition shingles, a detailed method of applying each type cannot be given here. However, most of the fundamentals of laying shingles have been given in the previous pages. The learner should follow the directions for application as given by the manufacturer of the particular shingle.

TYPES OF PORCH TRIM

OBJECTIVES OF THE UNIT

1. To describe types of porches.
2. To describe porch floors, columns, roofs, cornices and decks.
3. To describe porch steps and balustrades.

INTRODUCTORY INFORMATION

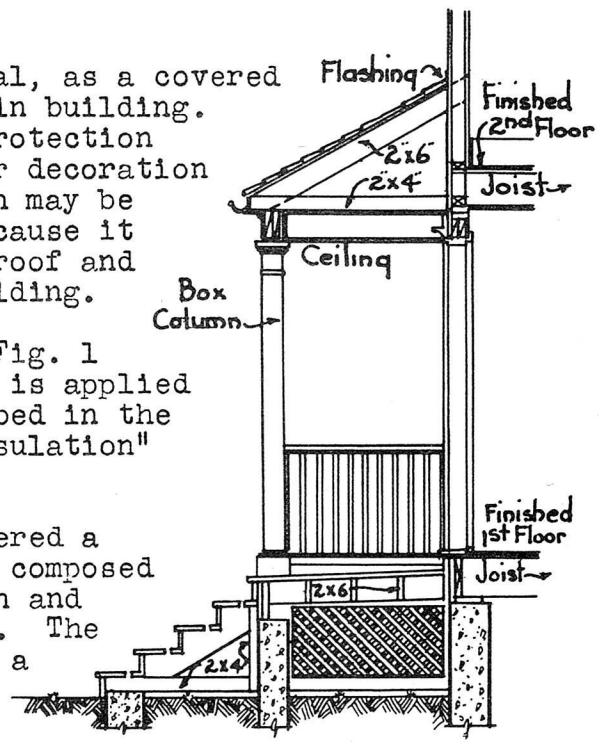
Since there are many types and designs of porches, it is impossible to describe any one type that will cover the most common porches. It will be more practicable in this unit to describe the general construction of the sections that go to make the completed porch or canopy. In this way the learner may become familiar with the fundamental construction and functions of each section. This in turn should enable him to use this knowledge in the formation of any particular type of porch.

TYPES OF PORCHES

A porch may be defined, in general, as a covered projection at the entrance to the main building. Its chief functions are to provide protection from the weather, a means of exterior decoration and additional living space. A porch may be considered an individual building because it is composed of a foundation, frame, roof and trim similar to that of the main building.

The open porch such as shown in Fig. 1 gives a general idea of how the trim is applied to a frame similar to the one described in the monograph "Framing, Sheathing and Insulation" of this Carpentry Series.

The enclosed porch may be considered a projection or bay as it is generally composed of the same type of wall construction and window openings as the main building. The enclosure may also be constructed of a thin panel wall and sash 1 1/16 in. thick which may be removed in summer and replaced by screens (Fig. 2). This type, although considered an enclosed porch, has little value as living quarters in the winter because



SECTION THRU OPEN PORCH

FIG. 1

of the difficulty in heating. There should be a means of closing off this type of enclosure from the main living rooms during the winter months.

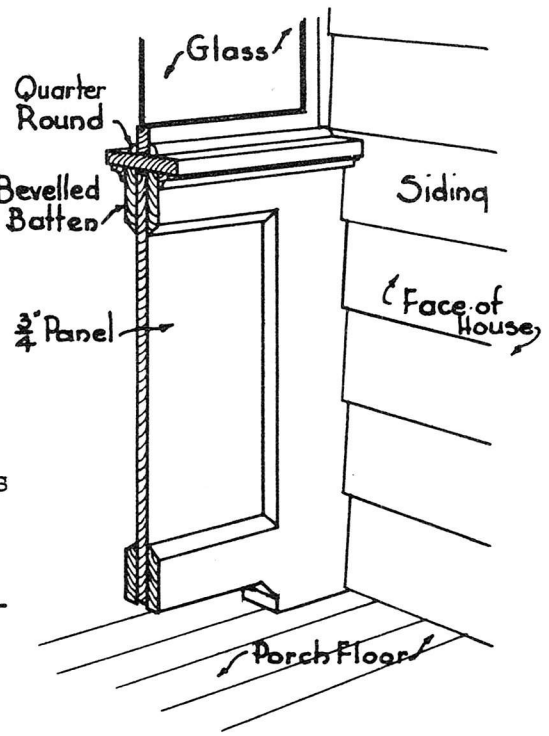
PORCH FRAMING AND FLOORS

A description of the structural frame members of the porch and floor is given in Unit 1C-T50 in the monograph "Framing, Sheathing and Insulation".

PORCH COLUMNS

The structural foundation of columns is described in Unit 1C-T50.

Some porch columns are built up of structural members and enclosed with exterior trim on the job while others are hollow and made at the mill of material thick enough to support the load. The base of any type of column should be so constructed that it will support the column and its load. It should be ventilated and must be so constructed that moisture will not accumulate around the base.



SECTION OF ENCLOSED PORCH PANELLED RAILING

FIG. 2

Figure 3 shows a common method of forming the base of round or square hollow columns usually made at the mill. The base is generally made of solid wood hollowed out at the bottom with the exception of the four corners. This cuts down the surface area of the base which comes in contact with the flooring and provides ventilation at this point. This form of base is easily removed from the bottom of the column shaft and replaced in case it rots.

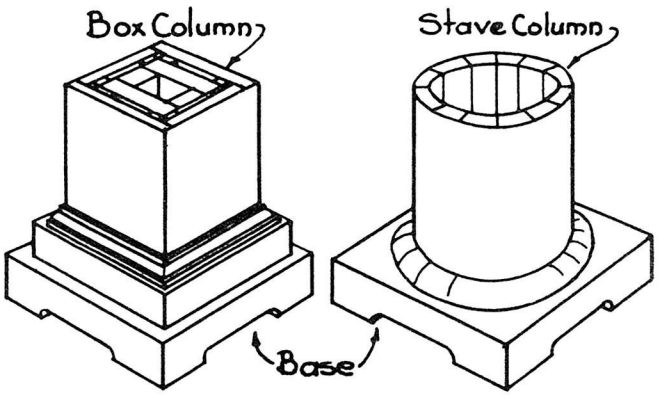
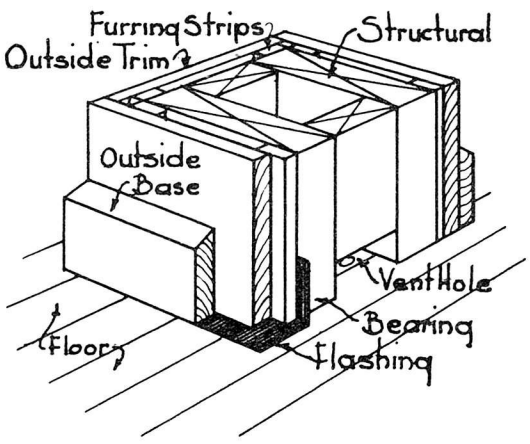


FIG. 3

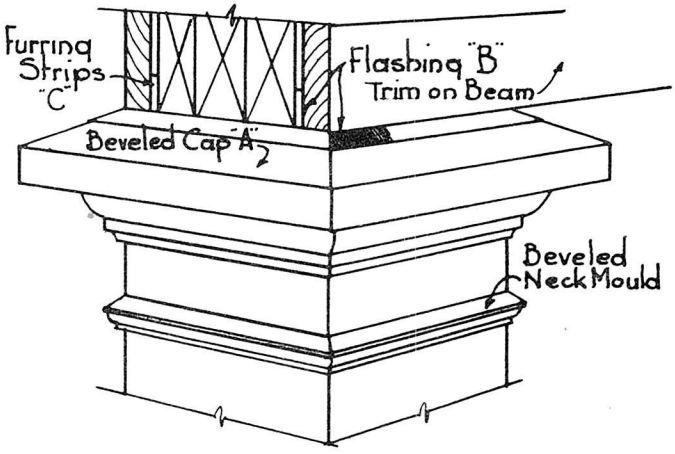
SQUARE AND ROUND COLUMN BASES

Figure 4 shows a method of protecting the base of a built-up column and providing ventilation. The surface of all members of the column at the base that are inaccessible to the painter should thoroughly



BASE OF BUILT-UP COLUMN

FIG. 4



CAP OF BUILT-UP COLUMN

FIG. 5

painted or treated with some wood preservative before they are permanently placed. Metal flashing should be installed at the base of the column where the water has a tendency to lodge. See the flashing in Fig. 4. The outside trim that is nailed to the core of the column should be furred out at least $\frac{1}{4}$ in. to allow for ventilation between the back of the trim and the face of the core (Fig. 4).

All neck mouldings and column caps should be beveled on the top surface to drain the water and prevent it from lodging and rotting the wood. See A, Fig. 5. Metal flashings are sometimes necessary at the top of the column to prevent the water being driven by wind into the bearing seat of the column and truss (B, Fig. 5). Furring strips should also be used at the back of the trim which is nailed on the sides and bottom of the porch truss (C, Fig. 5).

PORCH CORNICE

Generally, the cornice used on the porch is similar to that of the main building. See Unit 1C-T57.

PORCH ROOFS

The material on roof framing and special roofing problems of the main building in the monograph "Framing, Sheathing and Insulation" and the description of roofing materials in Units 1C-T58 and 1C-T59 of this book may be referred to. These principles may be applied to the porch roof since a main roof and porch roof are very similar.

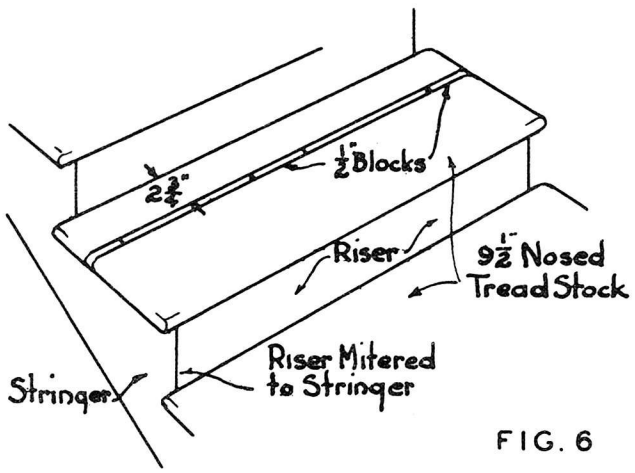


FIG. 6

PORCH STEPS

PORCH STEPS

For information about forms for concrete steps, refer to Unit 1C-T28 in the monograph "Concrete Form Construction" of this Carpentry Series. Information on the layout of stair carriages is given in Unit 1C-T55 in the monograph "Framing, Sheathing and Insulation".

Careful consideration in the layout of porch steps must be given to the proportioning of risers and treads. Because the surfaces of the treads on outside steps may become slippery during the winter months, they should be so made that the water will be drained from their surface and so that the underside of the steps will be ventilated. In no case should the width of the treads be less than 12 in. This measurement includes the overhang of the nosing.

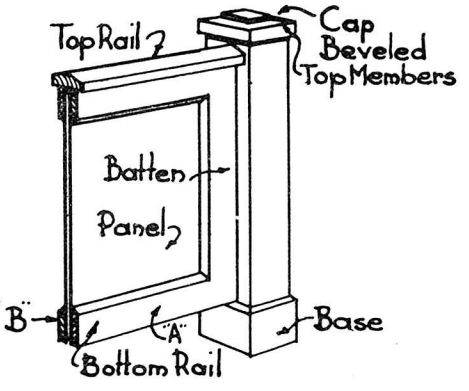
Figure 6 shows a common method of draining the surfaces of treads. In some cases small holes are bored through the tops of the treads to provide drainage.

All wood used in porch steps should be painted on all surfaces or treated with some wood preservative before it is placed. The supporting members should rest on concrete piers and their bearing surfaces should be at least three inches off the ground.

BALUSTRADES AND DECK POSTS

The trend of modern exterior trim is to eliminate, as far as possible, pockets, ledges and curved surfaces of porches that may retain moisture and are difficult to paint. The solid panel rail or open lattice type of balustrade are commonly used rather than the ornate spindle type.

The function of a balustrade on a porch or deck is to provide protection to the occupants and to improve the appearance of the building. All members that are exposed to water or snow should be tapered on the top to shed the water and to prevent rot. Intersections of flat members such as in



DECK BALUSTRADE

FIG. 7

the panel section of Fig. 7 should be so fitted that the water will shed from the joint. The edges of the top and bottom rails and the battens at the panels should be beveled to shed the water and to eliminate the use of a cove or quarter round moulding, thus cutting down the number of joints and giving practically the same appearance to the panel.

The posts for decks and balustrades should be attached to the porch frame and deck as shown in Fig. 8. The core of the post runs through the flooring and is spiked to the side of a porch joist or rafter. This provides a rigid core upon which the post casing may be nailed.

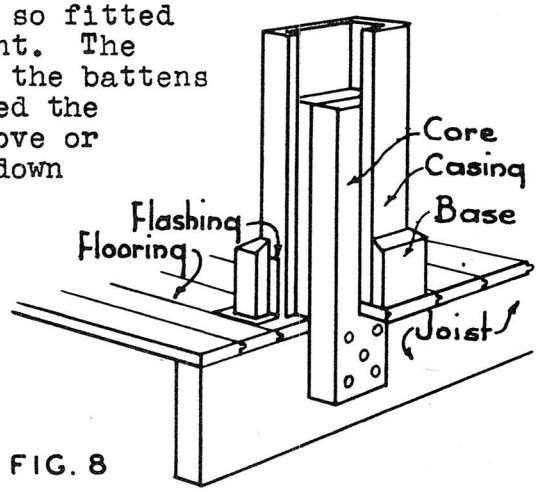


FIG. 8

DECK POST CORE
SPIKED TO JOIST

The flooring around the edges of the post should be well supported and should be flashed with metal flashing. The base trim of the column may be kept about $\frac{1}{4}$ in. off the surface of the roofing material.

SELECTED REFERENCES

House Construction Details ..... Burbank

Audels Carpenters and Builders Guide #4 ..... Graham and Emery

HOW TO APPLY PORCH TRIM

OBJECTIVES OF THE UNIT

1. To show how to lay porch floors.
2. To show how to build porch columns.
3. To show how to build and erect porch roofs, cornices and decks.
4. To show how to build porch steps and balustrades.

INTRODUCTORY INFORMATION

The steps outlined in this unit are applied more to the fundamental processes of assembly of trim members and sections, rather than to the completed porch. It is more important for the learner to concentrate on the correct assembly of sections than to study some typical porch plan which may become out of date in a short time.

TOOLS AND EQUIPMENT

Crosscut saw	Try square	Plumb bob
Rip saw	Spirit level	Plane
Hammer	Straight edge	1½ in. chisel
Framing square	Chalk line	Hatchet

PROCEDURE

HOW TO LAY PORCH FLOORS

1. Select clear sound stock and cut it to the correct length so that it will project beyond the face of the front joist header about 3½ in.

   NOTE: Porch flooring should be painted on both faces and edges and left to dry before it is laid. Some mechanics paint just the tongue and groove edges and lay the flooring while the paint is wet. This tends to make the joint waterproof.

2. Start the first length by temporarily face nailing it in line with the side header of the porch joists.

3. Toenail each successive board to each joist, being careful not to drive the starting board out of line. Drive each board up enough to form a tight joint. Use 8d common coated nails.

   NOTE: It is desirable to use full length boards but if short pieces must be used, the joints must come on the center

of a joist and the butt ends of each piece must be painted and drawn up tight. Make no joints in the floor opposite the entrance door.

4. After the entire floor has been laid, mark the length it is to project over the front header on each side of the porch. Snap a line between these points and cut the flooring along this line.

5. Plane a nosing on the edge of the flooring.

6. Build the flooring out over the side headers far enough to form the same projection as on the front. Nail it in place and plane the nosing as on the front.

HOW TO BUILD PORCH COLUMNS

NOTE: Figure 1 shows a typical square hollow column such as is often made of 3/4 in. or 1 1/16 in. dressed stock.

A. HOW TO BUILD THE COLUMN SHAFT

1. Determine the horizontal and vertical dimensions of the column shaft and select clear, dressed stock. It should be long enough to reach from the floor up to the truss.

2. Select the two boards that are to be used as the sides of the shaft. See A1 and A2 in Fig. 1.

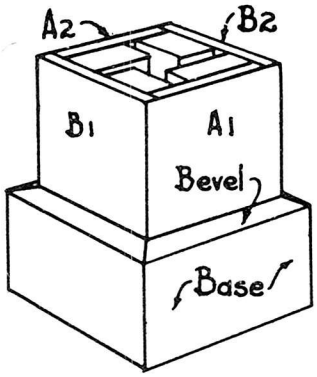
3. Bevel the edges of these two boards about 1/16 in. along their entire length so that they will form a tight joint when they are assembled against the sides of the casing B1 and B2.

4. Select the two boards B1 and B2. Set and space 8d casing nails every 14 in. along the edges of each board so that the nails may be driven into the edges of the pieces marked A1 and A2.

5. Assemble the shaft by driving the nails through one side of B1 and into one edge of A1.

   NOTE: In assembling these edges, work from one end of the shaft, keeping the edge of board B1 flush with the face of board A1 as the nails are driven along the shaft.

6. Proceed in a like manner to assemble boards A2 and B2. Assemble these two sections of the shaft in a similar manner.



SQUARE COLUMN

FIG. 1

7. Cut four pieces of 2 x 4 to a length that is equal to the distance from the top of the porch floor to the underside of the truss.

8. Insert these 2 x 4's into the assembled shaft at the corners as shown in Fig. 1 and secure them by nailing through the shaft into the 2 x 4's.

NOTE: If the core of the column is to be of the type as shown in Fig. 4, Unit 1C-T65, assemble the core first, then apply the furring strips and finally the outside casing.

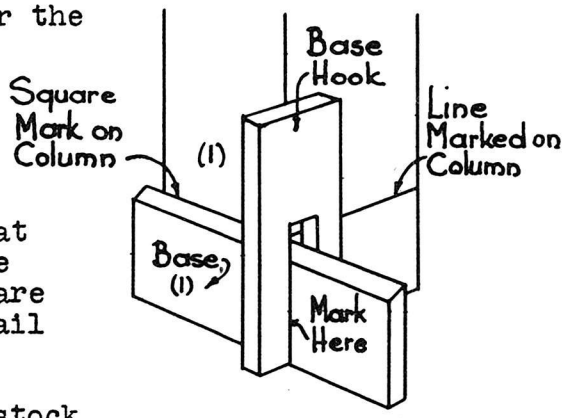
B. HOW TO APPLY THE BASE OF THE COLUMN

1. Select the stock to be used for the baseboards (Fig. 1) and cut four pieces about 4 in. longer than the width of the column shaft.

2. Bevel the top edges of the four pieces. This bevel should be about 10 degrees.

3. Square a line around the column showing the position of the top of the baseboards. If the column is tapered, mark a centerline on each face of the column over its entire length. Square from this line instead of from the edge of the shaft.

NOTE: To simplify the marking of the miters of the baseboard, a base hook may be made from the same stock that is to be used for the base. The hook is slipped over the edge of one piece of base when it is placed at the corner of the column as shown in Fig. 2.



USE OF BASE HOOK

FIG. 2

4. Place a piece of base in position at the bottom of the column. Keep the top edge of the base along the square mark on the column. Temporarily nail it in position.

5. Place the base hook over the base stock, holding it tightly against the column. Mark the base along the outside edge of the base hook. See Fig. 2. This mark shows the long edge of the miter cut.

6. Mark the top edge of the base at the corner of the column. This point shows the short point of the miter cut.

7. Use a fine crosscut saw to cut the miter. Cut on the outside of the line, thus leaving a little stock in case the miter cut needs a little planing for fitting.

8. Mark the opposite end of the base in the same manner. Before taking the base stock off the column, mark the base and the side of the column so that the baseboard will be put on the same side of the column when it is permanently placed. See Fig. 2.

9. Place, mark and cut a piece of base in a similar way for each of the remaining sides of the column.

10. Replace each piece in its respective position and check the joints for fit. Plane the joints if necessary to produce a tight fit.

NOTE: Leave the base nailed temporarily as it will have to be removed when the column is set in position on the porch.

NOTE: This method of mitering the base is simpler than using the sliding T bevel or the miter box, especially if the column is tapered.

C. HOW TO APPLY THE CAP

NOTE: Figure 5, Unit 1C-T65 shows a typical cap composed of mouldings nailed around the column. The top of the upper member of this cap is flush with the top of the column (the bottom of the truss).

1. Cut four pieces of cap stock long enough to allow for the miter of each end of the stock. Bevel the top of the cap.

2. Place a piece of cap stock at the side of the column at the top and mark it at the corners of the column. These points mark the short point of the miter cut.

3. Cut the miters in a miter box and tack the piece temporarily in place.

4. Continue in the same manner on the other sides of the column. Check the joints for fit and plane them if necessary. When they fit, nail them in position permanently and set the nails.

NOTE: The same processes may be used in fitting the moulding around the column.

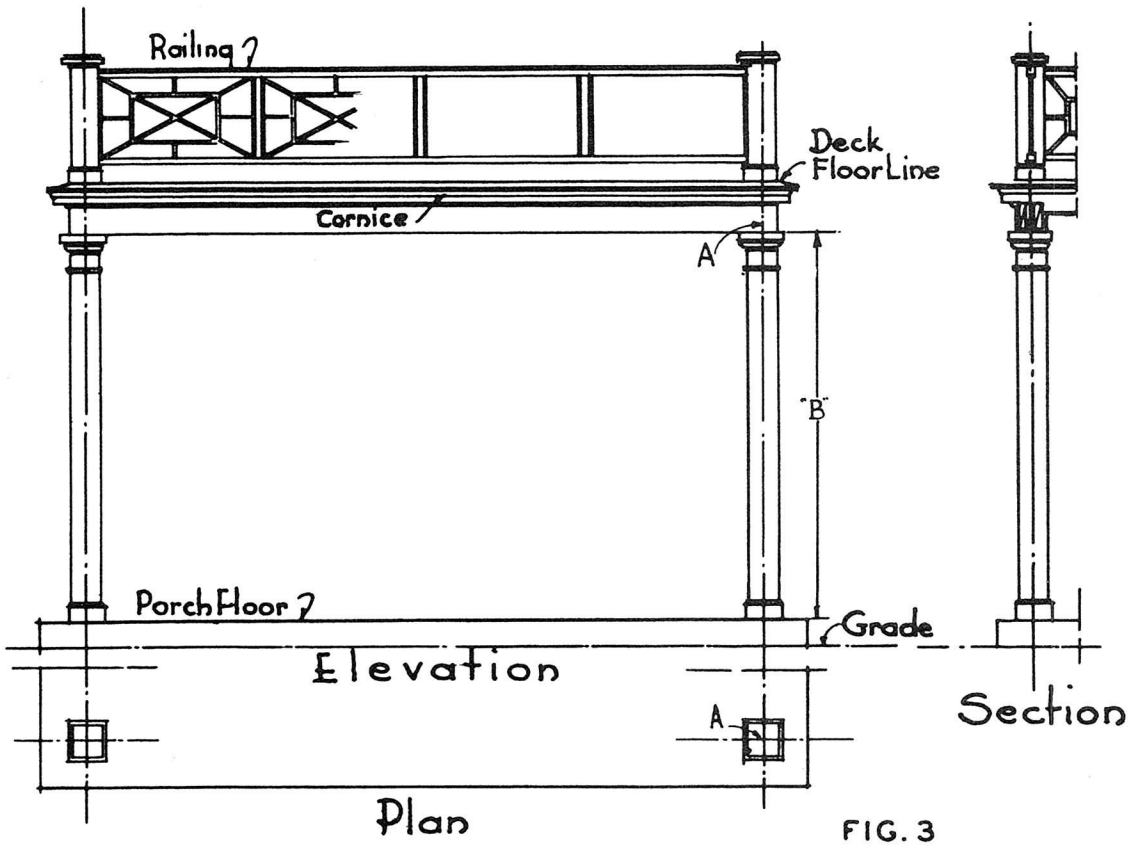


FIG. 3

CENTERING OF POSTS

D. HOW TO SET PORCH COLUMNS

NOTE: The framework of the porch cornice and roof is generally supported by temporary columns during the framing of the building. These columns should not be placed in a position that will interfere with the setting of the permanent column unless the frame or core of the column is permanent as shown in Unit 1C-P50.

All columns and deck posts should be set so that their centers line up with the center lines of the porch cornice box or lintel. This is illustrated in the porch floor plan shown in Fig. 3.

1. Locate the center lines of the side and front cornice boxes at the corner. The intersection of these lines gives the center of the top of the porch column. See A in the floor plan of Fig. 3 and A in the elevation.

2. Plumb down from this point to the porch floor with a plumb bob and line. This point on the floor locates the center of the column.

3. Lay out the base size of the column on the floor around the center mark. See the floor plan (Fig. 3). Repeat these operations for the opposite corner of the porch.

4. Remove the temporarily nailed base from the column.

5. Check the cornice box or truss framework to see that it is level. If so, measure the distance from the bottom of the box to the top of the floor. See B in the elevation, Fig. 3.

6. Mark this distance on the column, measuring from the top of the cap to the base of the column. Square a line around the column at this point, remembering to allow for the slope of the porch floor. Cut the column off along this line.

7. Thoroughly paint the floor surface which is to be covered by the column.

8. Place the column in position by temporarily raising the cornice box or truss about 1 in. Nail the column to the box so that it lines up with the center lines. B1 or B2 of Fig. 1 shows the front of the column.

9. Lower the cornice box and check the column on both front and side for plumbness. Nail the bottom of the column to the porch floor.

10. Insert the flashing at the base and top of the column as described in Unit 1C-T65 and replace the base on the column.

    NOTE: In replacing the base it will be necessary to taper the bottom of the base to fit the slope of the porch floor. It is best to replace the front piece of base first and then scribe the other pieces to the floor so that the tops of these pieces will be even with the square marks on the sides of the column.

    NOTE: Sometimes when metal flashing is used at the base of columns it is necessary to gouge out the back of the base to allow for the thickness of the metal and allow the miter joints to come up tight.

11. Have the base of the column and the back of the base painted and securely nail the base in place.

HOW TO BUILD PORCH ROOFS

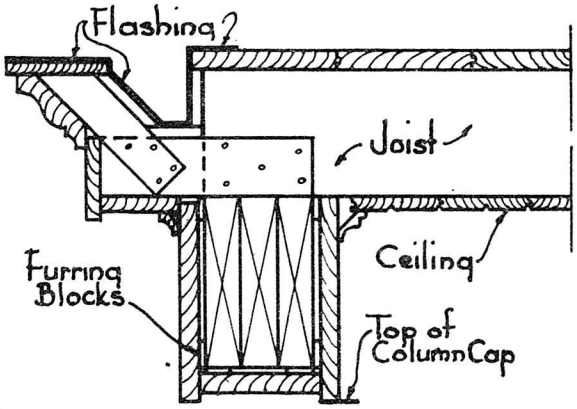
NOTE: The information on the layout and erection of roof rafters given in units on roof framing in the monograph "Framing, Sheathing and Insulation" should be sufficient for the erection of porch roofs. The necessary processes involved

in applying roof and deck coverings are given in Unit 1C-P58.

HOW TO BUILD A PORCH CORNICE

NOTE: Porch cornices are generally of the same style as those of the main building. The processes involved are described in Unit 1C-P57 "How to Build Common Types of Cornices".

Figure 4 shows a method of enclosing the porch framework with the cornice trim.



PORCH CORNICE

FIG. 4

1. Furr the sides of the truss with 1/4 in. strips so that the trim will not be directly against the truss (Fig. 4).

2. Case the three sides of the truss A as shown in Fig. 4.

3. Lay out, cut and secure lookout brackets according to the dimensions of the plancier, fascia and crown moulding.

4. Construct the rest of the cornice as described in Unit 1C-P57.

5. If there is to be a deck over the porch, lay the deck flooring and canvas roofing as explained in Unit 1C-P59.

6. Lay the porch ceiling across the porch ceiling joists. Nail all boards through the tongue. The only place face nailing occurs is where the ends of two boards are butted together.

7. Fit and nail a moulding around the intersection of the porch ceiling and the porch cornice box. See Fig. 4.

HOW TO BUILD PORCH STEPS

NOTE: The method of laying out carriages for porch steps is similar to that of laying out carriages for inside steps. Refer to "Framing, Sheathing and Insulation", Unit 1C-P55 for information on stair carriages.

1. Lay out and cut the required number of stair carriages. The carriages should be made of sound stock at least 1 5/8 in. x 11 1/2 in. and spaced in the stair frame no more than 2 ft. apart.

2. Lay out and cut the side finish stringers the same as the carriages except that the riser cuts are mitered as shown in Fig. 5. This is to allow the riser to be mitered to the stringer at this point. See B, Fig. 5. The tread cuts on the finish stringer are cut square the same as on the carriages. Cut a right and a left hand mitered stringer. This type of stringer may be 3/4 in. thick and about 11 1/2 in. wide clear stock.

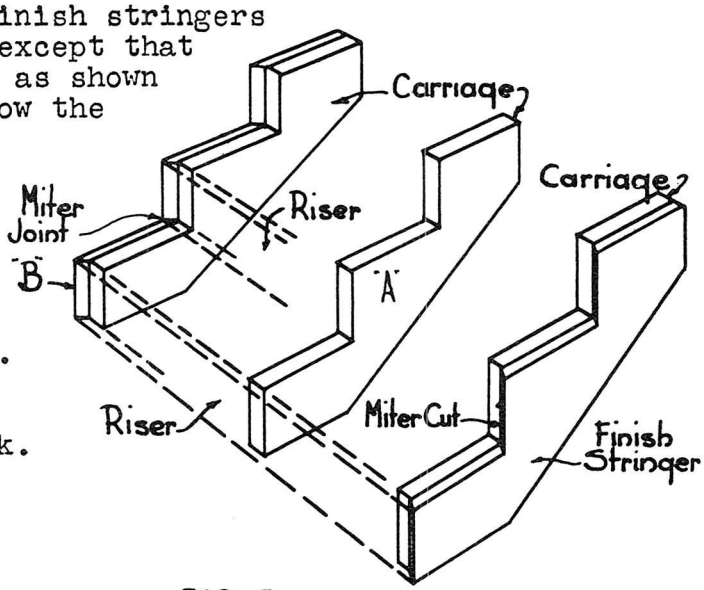


FIG. 5

PORCH STEP CARRIAGE AND STRINGERS

3. Assemble the mitered stringers to the carriages as shown in Fig. 5, keeping the tread cut of the stringer flush with the tread cut of the carriage and the short point of the riser miter cut flush with the riser cut of the carriage.

4. Cut the required number of finish riser boards. They should be as long as the width of the steps. Miter the ends of these boards.

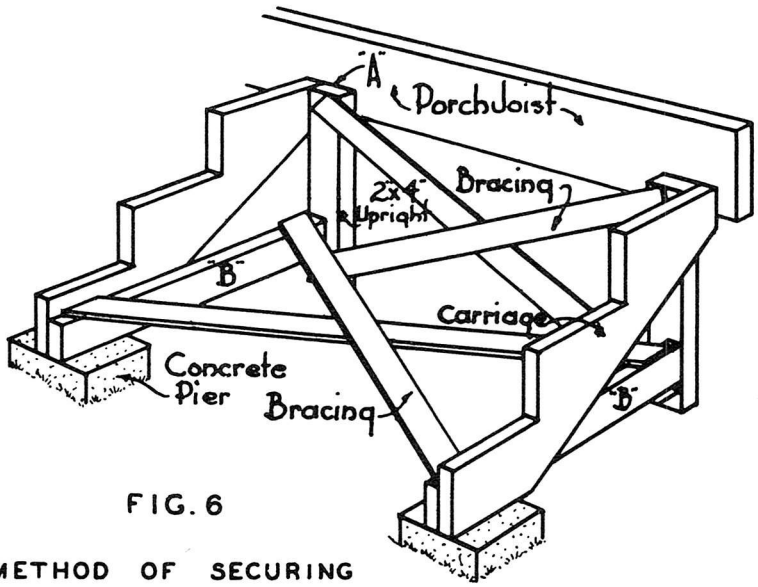


FIG. 6

METHOD OF SECURING STAIR CARRIAGES TO PORCH

5. Nail the riser boards to the mitered cuts of the finished stringers and to the stair carriages. See Fig. 5.

6. Place and secure the intermediate stair carriages (A, Fig. 5) to the riser boards, keeping the tread cuts of the carriages flush with the tops of the riser boards. Nail through the face of the riser boards into the carriages. Brace and square this framework.

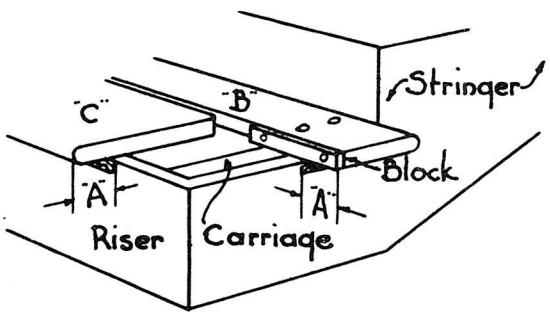
7. Spike 2 x 4 uprights to the porch header at the position where the stair carriages are to be located on the header. See A, Fig. 6.

8. Spike the carriages to the sides of these uprights, making sure that the distance from the top of the stair carriage to underside of the porch floor is the same as the height of a riser cut of the carriage.

9. Level the carriages and brace them as shown in Fig. 6 with 3/4 in. x 4 in. ties spiked to the stringers and to the uprights as shown.

10. Square and brace the carriages with cross braces as shown.

11. Cut the required number of treads long enough to project over the outside face of the finish stringer on each side, the same distance they will project over the risers at the nosing. See A, Fig. 7.



PLACEMENT OF TREADS

FIG. 7

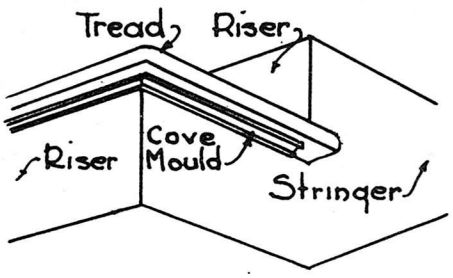
NOTE: If the treads are to be made up of three members as shown in Fig. 7, stock 1 1/16 in. x 2 5/8 in. is generally used for the member B. Parting strip stock is used for the blocks that are nailed to this member. The member C is regular nosed tread stock 1 1/16 in. thick and 9 1/2 in. or more wide, depending on the run of the step.

12. Nail the member B to the carriages as shown and also nail through the back of the riser boards into the edge of member B. Use 8d casing nails.

13. Cut parting strip blocks about 4 in. long and nail them to the edge of member C so that they will cover up the carriage and stringer edges and separate the members C and B. Nail these blocks at all points where the carriage edge will show from the top of the tread. See Fig. 7.

14. Nail the member C to the top of the carriage and tightly against the blocks. Also nail through the tread along the nosing line into the top edge of the riser. Space these nails about 12 in. apart.

15. Plane a nosing on the ends of the assembled treads to correspond to the nosing of member C.



LOCATION OF COVE MOULD UNDER TREAD

FIG. 8

16. Cut, fit and nail cove mouldings at the intersections of the underside of the treads and the face of the risers and stringers as shown in Fig. 8.

HOW TO BUILD A PORCH BALUSTRADE

NOTE: Figure 8 of Unit 1C-T65 shows how the core of the balustrade post is supported by allowing it to run down through the porch deck to be attached to the joist or ceiling rafter.

A. POSTS

1. Build up the core of the post according to the size of the finished post.

   NOTE: It is not necessary to run the core the full height of the post, as the post supports no load.

2. Cut the core long enough so that it may be firmly spiked to the joists and so it will extend above the deck about 12 in. See Fig. 8, Unit 1C-T65.

3. Locate the position of the post on the deck. Cut the flooring if it is already placed, and temporarily spike the core to the joists or to the blocking that is spiked between the joists.

4. Plumb the core and permanently spike it to the joist or blocking.

5. Place the headers around the core so as to support the deck flooring around the post core.

6. Replace the flooring and build the post casing around the core, following the same general processes as outlined for building porch columns. The procedures of placing the flashing, paint, baseboard, mouldings and cap are also similar. Set and build all posts in a similar manner.

B. RAILS

NOTE: Figure 9 shows how two members of a solid panel rail may be assembled.

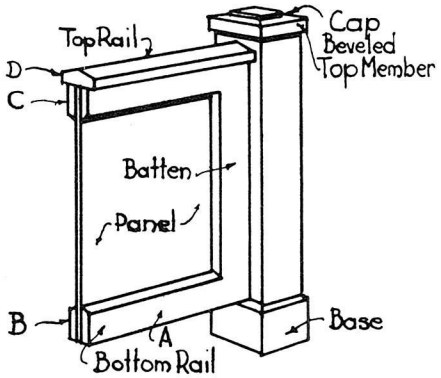
1. Check to see that the deck posts are plumb. Assemble the double bottom rail members A and B by inserting blocks the same thick-

ness as the panel stock about every 3 ft. of the rail length. Temporarily nail the members together at the block locations. Make the upper rail C in a similar way.

2. Locate the position of the bottom rail on the sides of the posts. Cut the rail to length and nail it in the center of the width of the post and at the marked positions (Fig. 9).

3. Remove the blocks.

4. Cut and fit the panel stock into the bottom rail and against the posts.



DECK BALUSTRADE

FIG. 9

5. Locate the position of the upper rail C, Fig. 9 in the same manner as the lower rail. Cut and fit this rail over the top of the panel.

6. Cut, fit and nail the battens at the sides of the posts or at any desirable positions to form the ends of the panel.

7. Cut, fit and nail the rail cap D, Fig. 9.

NOTE: If it is desired to use lattice work in the balustrade instead of the solid panel, the strips that form the lattice should run between the double members of the top and bottom rails. See the elevation, Fig. 3.

DESCRIPTION OF FRONT ENTRANCES

OBJECTIVES OF THE UNIT

1. To describe a canopy entrance.

2. To describe a recessed entrance.

INTRODUCTORY INFORMATION

Front and side door entrances are often protected from the weather by a small hood or canopy. Since the hood is small, it may be supported by brackets fastened to pilasters which take the place of columns. If the floor line of the building is some distance above the sidewalk level, a platform or steps may be provided.

Another common method of providing protection for front entrances is to recess the door into the building.

THE CANOPY ENTRANCE

Figure 1 shows a typical entrance. The steps, in this case, are made of wood and are similar to porch steps. They may, however, be more elaborate and have masonry steps with wider treads. An ornamental iron hand rail may be included. This type of entrance is used in many different designs and may be found on both large and small dwellings.

Pilasters or half columns on the surface of the building are used instead of full columns to support the canopy and to decorate the entrance.

Brackets to support the outer ends of the canopy may be of a simple and straight design or they may be elaborate and curved. They may be composed of either solid or built-up stock.

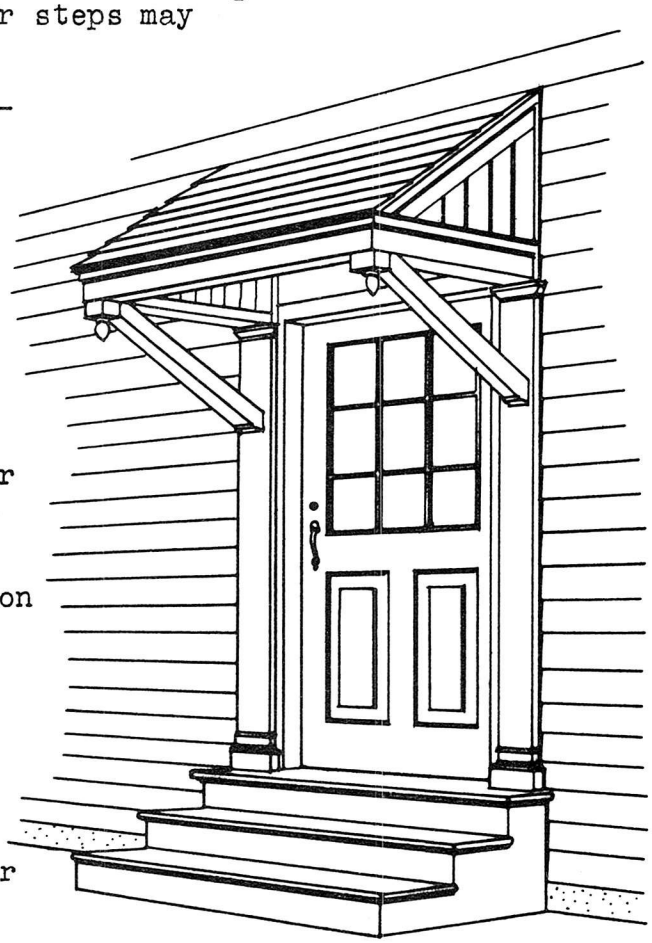


FIG. 1
ENTRANCE WITH CANOPY AND BRACKETS

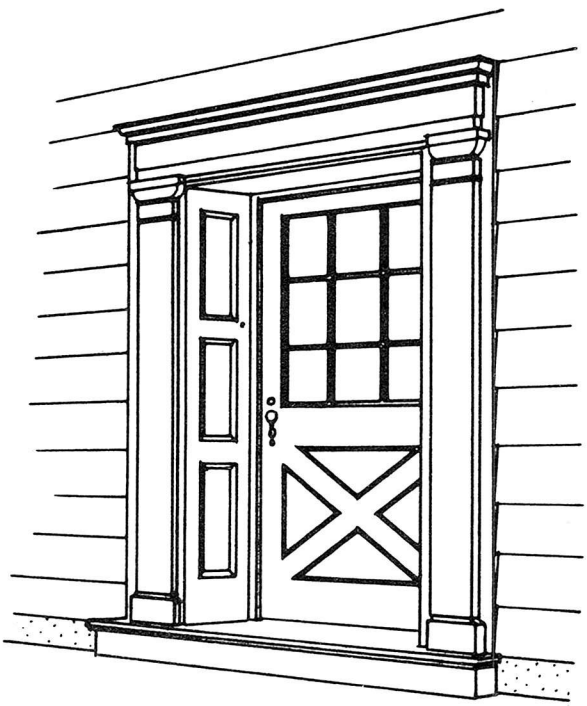
The cornice members may be similar to those used on a porch but of smaller dimensions and in proportion to the rest of the canopy.

The canopy may be made with a shed gable or hip roof or with a flat deck and rail. The ceiling of the type of canopy shown in Fig. 1 is generally finished like a porch ceiling. The triangular sides are finished with 3/8 in. ceiling boards or panels.

THE RECESSED ENTRANCE

Figure 2 shows a recessed entrance. This type of entrance provides weather protection equivalent to that of the canopy type. The door is set back from the outside of the building, sometimes as much as two feet, thus forming an offset in the entrance wall and providing closet space at the entrance. The exterior may be finished in many styles and many standard forms may be obtained from the mill ready to install.

The step is often masonry and floor tile. The pilasters may be similar to those used with the canopy but the head trim is often more elaborate, having a straight wide built-up frieze, or curved pendents extending from both ends of the frieze. The sides of the recess are often paneled or flush surfaces and the top or ceiling is finished to match or it may be finished with beaded ceiling similar to that of the porch.



RECESSED ENTRANCE

FIG. 2

SELECTED REFERENCES

House Construction Details ..... Burbank

Millwork catalogs .....

HOW TO BUILD FRONT ENTRANCES

OBJECTIVES OF THE UNIT

1. How to build a canopy entrance.
2. How to build a recessed entrance.

INTRODUCTORY INFORMATION

The building of the platform, supports, roof and cornice of a front entrance is similar to the building of these units of a porch. There are, however, some different procedures to be followed in the building of small porches.

TOOLS AND EQUIPMENT

Hammer
Crosscut saw 8 pt.
Crosscut saw 10 pt.
Steel square - try square
Nail set
Spirit level
Straightedge
Pinch bar
Plane
Miter box

PROCEDURE

HOW TO BUILD THE CANOPY CORNICE

NOTE: The cornice box is sometimes made and then erected and supported on temporary columns. The finish brackets are set after the roof work has been completed and the scaffolds have been taken down. See Fig. 1, Unit 1C-T66.

1. Lay out the rough framework that is to support the roof rafters.

   NOTE: This may be composed of a single or double 2 x 6's or 2 x 8's, depending upon the size of the canopy. The side members sometimes extend to the inside edges of the building studs and are spiked to them. This gives more support to the overhanging canopy frame.

2. Mark the center lines and levels to show the position in which the framework is to be nailed on the building.
3. Erect temporary posts to support the framework.
4. Erect and spike the frame to the marks. Brace the frame so that it is held square and level.
5. Apply the cornice trim to this framework in the same general way as shown in Fig. 1, Unit 1C-T66. Refer to Unit 1C-P57 for details of applying cornice trim.

HOW TO BUILD A CANOPY ROOF

NOTE: Units 1C-P50 and 1C-P65 describe how to install the ceiling joists, roof rafters and roof boards of the canopy. Units 1C-P58 and 1C-P59 show how to place the roof covering on the canopy.

HOW TO BUILD PILASTERS

NOTE: The procedures for building and erecting the pilasters for this type of entrance are similar to those described for porches in Unit 1C-P65.

1. Build the half columns or pilasters in the same general way as the full columns except that only one face and a portion of two sides need to be finished.

2. Put building paper on the surface of the building where the pilasters are to be located. Erect and plumb them in position, the same as full columns. Nail them to the building.

HOW TO BUILD SUPPORTING BRACKETS

1. Build the supporting brackets by nailing two 2 x 4's together and casing them with finish material.

2. Lay out the ends to the proper length and angle by using the steel square in the same way as in finding the length and cuts of a rafter. Assemble the brackets as shown in Fig. 1, Unit 1C-T66.

   NOTE: The angle of the supporting brace should be about 45 degrees and may also be found by using the brace table found on most steel squares.

3. Check the cornice of the canopy to see that it is level both ways.

4. Nail the supporting brackets in place on the face of the pilaster and to the bottom of the cornice.

5. Remove the temporary posts that support the canopy and fasten the ornament at the upper end of the bracket.

   NOTE: If the brackets are obtained from the mill, they may be fitted and erected in the same general way.

6. Set all nails, and trim all protruding edges.

HOW TO BUILD A RECESSED ENTRANCE

NOTE: To build the recessed entrance shown in Fig. 2, Unit 1C-T66, proceed as follows:

1. Lay out the outline of the recess on the subfloor of the building at the proper location.

2. Erect the partition studs in the same way as for interior partitions and frame the door opening.

3. Lay out and place the ceiling joists.

4. Apply sheathing to the outside of the studs.

5. Apply the panels over building paper on the sheathing.

6. Provide support for the tile floor at the entrance by chamfering the edges of the joists and inserting sheathing between the joists. See Unit 1C-P52 of the monograph "Framing, Sheathing and Insulation".

7. Build and erect the pilasters in the same general way as for the canopy type entrance.

8. Build and erect the lintel over the door.

NOTE: This type of lintel is sometimes built to represent a half frieze or it may be a more elaborate type obtained from the mill. Regardless of what type it is, it should be well flashed so that moisture cannot enter into the building and down through the entrance.

Part II

Units of Instruction in

INTERIOR TRIM

METHODS OF HANGING WINDOW SASH

OBJECTIVES OF THE UNIT

1. To describe methods of hanging single sash.
2. To describe methods of hanging double sash.
3. To describe methods of installing sliding sash.

INTRODUCTORY INFORMATION

Several methods are used to hang sash in a window frame. In any method, the important considerations are ease of operation, ease of cleaning, conservation of space in the operation of the sash and the extent to which the sash will keep out the weather. Window openings in an insulated building account for a large percentage of the heat loss in cold weather because of the amount of glass area and also because of leakage of air around the edges. Anything which reduces this leakage will also reduce the amount of fuel burned.

METHODS OF HANGING SINGLE SASH

Basement and attic sash are generally fitted so that they may be hung on hinges. The sash should be fitted with about 1/8 in. clearance on all edges between the sash and the frame. This is to allow for the expansion of the wood members. This is especially important in the basement. The hinges may be applied to the top or side of the frame and let in the jamb as a butt hinge, or fastened to the surface of the sash and edge of the jamb as a surface hinge. Special hardware, such as extension hinges that hold the window open, and fasteners that lock the sash is often used.

In some cases, the single sash is fitted into the frame so that it may be permanently nailed in place. In this case, the sash should be fitted with about a 1/16 in. clearance, and the edges of the sash and the jamb and sill surfaces should be painted before the sash is permanently placed.

Casement sash are generally fitted to the frames so that they may swing to the outside. In the casement frame shown in Fig. 2 of Unit 1C-T60, the sill and jambs are so machined that the fitting of the sash is practically the same whether the sash swings in or out. In this case, the sash are generally hung on butt hinges let in the sides of the jamb, and locked by a simple casement fastener or operated to any position by turning a crank which controls an extension rod fastened to the sash.

METHODS OF HANGING DOUBLE HUNG SASH

Double hung sash are generally fitted into a frame having two runways. The lower sash slides to the top or bottom of the frame on the inner runway. The upper sash slides in a similar manner in an outer runway.

The upper and lower sash are generally the same size so that when the windows are closed, the meeting rails of both sash are midway between the head jamb and sill. There are cases, however where the upper sash may take less than half of the height of the opening, the lower sash height taking up the remaining height. Then the meeting rails would meet above the center.

Many double hung sash have grooves on the outer edge of the side rails into which a sash cord is fastened. The sash cord operates over a pulley at the top of the frame and down the inside of the jamb where it is fastened to a round counterweight which balances the sash.

Each sash should be weighed, and two weights equal to the weight of the sash should be provided, one for each side of the window frame. Some carpenters prefer to have the weights about one half pound heavier than the weight of the sash to allow for the friction of the sash in the runways.

The chief disadvantage of this type of balance is that a pocket must be provided at either side of the frame to allow room in which the weights may be housed. This necessitates the use of wide casings on the inside and outside of the frame. This condition may be avoided by using a flat weight in the frame where narrow trim is desired.

Another method of counterbalancing sash is by the use of an adjustable sash balance which is set in the head or side jamb of the frame in the same manner as a sash cord pulley. The adjustable balance consists of a metal strap which is fastened to the edges of the sash. The opposite end of the strap is coiled around a spring which may be adjusted to the tension necessary to balance the sash.

The spiral type balance works on a similar principle. It is housed in a unit which fits into a groove in the edges of the stiles of each sash. The unit consists of a flexible wire spring inside a metal casing and has a hanger at the top and a slotted fitting at the bottom through which slides a spiral rod. The hanger is fastened at the top of the side jamb of the frame. The spiral rod or sash holder is fastened to the bottom of the lower sash rail. Enough tension is applied to the spring to balance the weight of the sash by turning the sash holder a few turns before it is fastened to the rail. The edges of the sash must be ploughed at the mill to receive this type of balance.

The spring cushion or friction type of sash balance works on a principle of friction against the edges of the sash as it is moved in the runways. Special runway guides are fitted to the stiles of the sash and to the side jambs of the window frame. On one side of the window, the runway guide is forced against the sash by compression springs located between the guide and the window jamb. These springs may be adjusted to a compression that will cause the guide to be held tightly against the sash, thus producing a cushion-like friction sufficient to hold the sash in any position in the runway. This type allows the sash to be removed easily for cleaning and painting and allows full window opening for ventilation in summer.

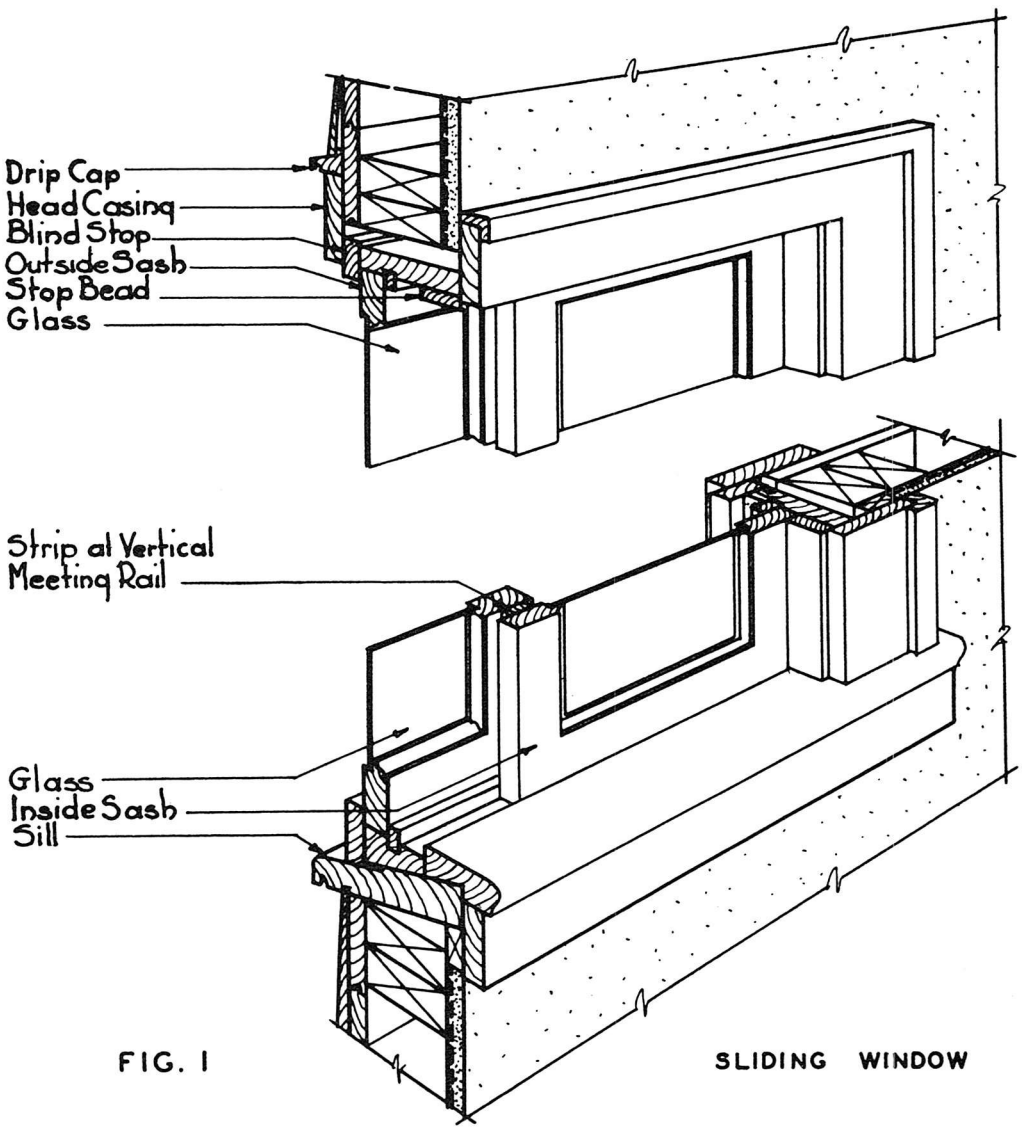


FIG. 1 SLIDING WINDOW

METHODS OF INSTALLING SLIDING SASH

Horizontal sliding sash may be installed by placing runways at the sill of a large casement window frame. This requires a filler strip which is ploughed similar to the side jamb and is beveled to fit the sill so that the top of the strip, where the sash slide is level. See Fig. 1.

Another form of sliding sash acts in a ploughed track in the sill and head jamb. These guide the sash past one another in a single casement frame. This method of operating the sash in the frame is often used where the sash are large and the double hung system could not be used. Sash up to 5 ft. 8 in. wide by 5 ft. 6 in. high may be used without counterweights. The sash, when closed, fall in the same plane as those of a hinged casement sash. When open, the right hand sash glides into an inner head and sill track so that the sash can pass each other. The sash may easily be removed for cleaning and for placing storm sash or screens. The operating equipment includes two steel guides attached to the bottom of each sash and two steel guide pins at the top plus the operating handle and lock.

There are several other methods of hanging sash in a frame. Some require a special frame and others may be adapted to a standard frame. However, it is advisable to hang the sash in a frame particularly designed for that type of hanging. In most cases the sash should be prefitted to the frame at the mill so as to avoid any looseness at the window opening. More detailed information on these hanging methods may be found in the references given at the end of this unit.

SELECTED REFERENCES

House Construction Details ..... Burbank

Good Practice in Construction ..... Knobloch

Architectural Graphic Standards ..... Ramsey and Sleeper

HOW TO FIT WINDOW SASH

OBJECTIVES OF THE UNIT

1. To show how to fit and hang basement sash.
2. To show how to fit and hang double hung sash.
3. To show how to fit and hang casement sash.
4. To show how to fit sliding sash.
5. To show how to fit and hang storm sash.

INTRODUCTORY INFORMATION

The fitting and hanging of sash most commonly used in the plain type frames will be given in detail in this unit. This should give the learner the basic principles of sash fitting and hanging. However, since the fitting of sash in prefabricated frames presents so many variations, the instructions given by the manufacturers of the particular sash and frame should be followed.

TOOLS AND EQUIPMENT

Jack plane
Rabbet plane
Fine crosscut saw
Rip saw
Pocket knife
Butt gauge
Pencil
Rule
Try square
Steel square
Sliding T bevel
Scriber

HOW TO FIT BASEMENT SASH

NOTE: Figure 2, Unit 1C-T60 shows a basement frame with the sash in place.

1. Test the frame with a steel square at two diagonally opposite corners for squareness.
2. Measure the width of the sash opening in the frame. Take this measurement by using an inside measuring steel tape or a small wooden rod.
3. Transfer this distance to the sash, allowing an equal amount on each side. Mark these points on the side stiles.
4. Extend these points by drawing lines parallel to the edges of the stiles the full height of the sash.

5. Cut along these lines with a rip saw and plane the edges square and smooth. If only a small amount of stock is to be removed, use the plane only.

6. Measure the height of the sash opening on the inside of the frame.

7. Transfer this distance to the sash by measuring from the outside edge of the top rail and marking the distance on the bottom rail. The point on the bottom rail shows the height on the inside surface of the sash. Extend this point the length of the bottom rail.

8. Saw through the side stile with a fine crosscut saw, following the line on the bottom rail of the sash. Continue along the line with a rip saw until the opposite stile is reached. Finish the cut through this stile by using the crosscut saw.

9. Plane the surfaces smooth with a jack plane. Plane from the edges toward the center. Plane the top rail in the same manner.

10. Mark the size of the stop that is rabbetted in the sill, on the outside of the bottom rail.

11. Set the rabbet plane and plane a rabbet along the outside edge of the rail so that the rail will fit over the stop in the sill. Refer to Unit 1C-P8 of "The Use of Hand Tools and Portable Machinery" for cutting a rabbet joint.

12. Test the sash in the opening and refit it so there is an allowance of about 3/16 in. between the edges of the sash and the frame. Bevel the edges about 1/16 in. toward the outside and round the sharp edges about 1/8 in.

HOW TO HANG A SASH WITH HINGES

1. Adjust the sash in the opening so that none of the edges of the sash touch the frame. Small wedges may be used to hold the sash in place.

2. Locate the position of the hinges on the sash and window jamb. Use a nail or a nail set to mark holes through the holes of the hinges into the sash and jamb. Be sure the holes are square with the surface of the sash and jamb.

3. Drive enough screws through the holes in the hinges to hold them firmly in place.

4. Remove the wedges and try the sash for clearance and swing. If the sash swings clear, place the remaining screws in the hinges.

NOTE: If the sash binds it is generally caused by the outer edge of the hinge side of the sash rubbing against the stop in the frame, or by lack of clearance at the edges. These conditions may be corrected by removing the sash and providing clearance at these points.

5. Secure the locking device to the sash when it is in a closed position. Swing the sash to its full open position and secure it with hardware to hold it temporarily open.

HOW TO FIT DOUBLE HUNG SASH

1. Remove the parting strips from the side jambs of the frame.

2. Fit the upper sash in the same general manner as the single basement sash except that neither the meeting nor the top rail of this sash should be made narrower. Cut and plane the horns only.

3. Measure the distance the parting strip projects beyond the face of the jamb when the strip is fully seated in the rabbet of the jamb. This distance is generally about 5/8 in.

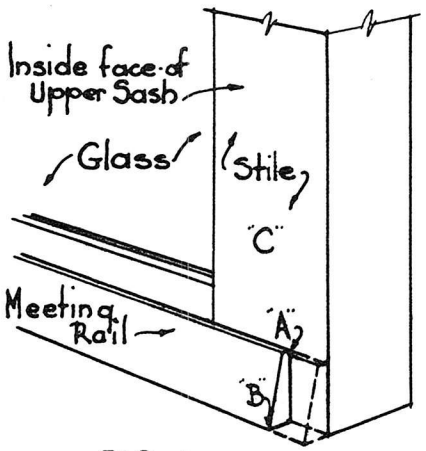


FIG. 1

MEETING RAIL NOTCH

4. Mark this distance on the meeting rail as shown at A, Fig. 1. Square from this point to the edge of the meeting rail as shown at B.

5. Cut out this piece with a fine crosscut saw. See the dotted line in Fig. 1.

6. Lay out and cut the other end of the meeting rail in the same manner.

7. Test the sash in the outer runway to see if it will slide easily the full height of the frame when the parting strips are in place. If it binds, remove it and plane or saw the edges that do not clear.

NOTE: If the width of the sash is correct and it still binds, check it at the sash cord slot where it passes over the pulley, and at the meeting rail where it passes over the parting strip.

8. When the sash is properly fitted so that it slides in the runway freely, raise it so that the top rail fits tightly to the head jamb and place a nail underneath the meeting rail in the runway to hold the sash temporarily in place.

9. Fit the lower sash in the same way as the upper sash.

10. Place it in the frame and set a scriber to the distance the top of the meeting rail of the bottom sash is above the top of the meeting rail of the top sash.

11. Lower the top sash half way and scribe the bottom rail of the bottom sash to the sill with the scriber.

12. Set the sliding T bevel to the slope of the sill and mark the side rails with the bevel setting, placing the long point of the bevel at the scribe mark. Cut and plane the bottom rail, following the bevel cut.

HOW TO INSTALL ROUND SASH WEIGHTS

NOTE: It is assumed that the correct sash weights and sash have been selected and that the sash have been fitted and removed from the frame.

1. Place the end of the sash cord through the outside pulley from the sash side. Tie a sash weight to the end of the cord that enters the pocket side of the jamb.

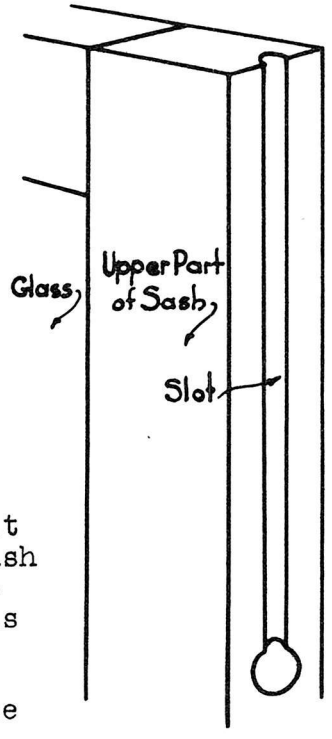
NOTE: Special fasteners are made for this purpose, but the carpenter generally uses a knot that tightens as the cord is pulled tight.

2. Pull the weight up through the pocket until it touches the inside of the pulley. Cut the sash cord off at a point about a foot from the top of the window sill. Form a short knot at this end.

3. Place a cord on the opposite side of the frame in the same manner.

4. Place the short knots in the round holes in both edges of the upper sash. See Fig. 2.

5. Replace the sash and test it for balance.



SASH CORD SLOT

FIG. 2

NOTE: If the weights hit the bottom header of the window opening, the sash cord is too long and should be shortened.

6. Hang the lower sash in a similar manner.

NOTE: In using the flat weights or chains instead of cord, the same general procedure should be followed. If the sash are to be hung with any of the newer type of balances the manufacturers instructions should be followed.

HOW TO FIT A CASEMENT SASH

NOTE: The inswinging casement sash is fitted in exactly the same manner as the basement sash. The outswinging sash is fitted the same as the lower sash of the double hung window except that there is no meeting rail to be notched.

HOW TO HANG A CASEMENT SASH

NOTE: These sash are hung in the same general way as the basement sash. The hinges may be placed on either side jamb and may be the butt type or the extended hinge type. Refer to Unit 1C-P2 of "The Use of Hand Tools and Portable Machinery" for the application of butt hinges. Extension hinges are applied in the same general manner.

HOW TO FIT SLIDING SASH

NOTE: Sliding sash are fitted the same as casement sash except that the bottom rail is left square instead of being beveled or rabbetted. A parting strip is nailed on the side rail where it overlaps the side rail of the opposite sliding sash. See Fig. 1, Unit 1C-T67.

HOW TO HANG SLIDING SASH

NOTE: In some cases, small brass rollers are inserted 3 in. from each end of the sash in the bottom rail so that the sash will roll along the surface of the runway more easily. Small metal round faced pins, metal weather strips or metal tracks are also used for this purpose.

1. Insert the rollers in the center of the thickness of the bottom rail. Cut into the rail deep enough to allow enough clearance for the rollers to revolve.

NOTE: If a metal track is used, the male section of the track should be used on the sill and the female section on the bottom rail. This also applies to metal weather strips.

HOW TO FIT STORM SASH

NOTE: Fit storm sash in the same manner as basement sash except for the bottom rail which is fitted like the bottom rail of a double hung sash. Be sure to allow 3/16 in. on all edges for paint and to avoid damage to the edges of the soft casing of the frames.

HOW TO HANG STORM SASH

NOTE: Special hanger hinges are made for storm sash and screens. These may be applied to the top of the sash in the same manner as surface hinges. Several types of hardware are used to hold the sash open or closed. Directions for applying them are generally enclosed in the package with the hardware. The description and application of this hardware will be covered in a later unit.

DESCRIPTION OF LATH AND PLASTER BASES

OBJECTIVES OF THE UNIT

1. To describe the types of plaster bases.
2. To describe the characteristics of plaster bases.
3. To describe the application of plaster bases.

INTRODUCTORY INFORMATION

There are two general types of plaster bases. The individual wood lath has been used universally for hundreds of years as a plaster base in frame and masonry buildings. The gypsum sheet plaster base is newer and more commonly used. Although defects in plastered surfaces are not necessarily the result of a faulty plaster base, the improper selection and application of this base may cause future trouble.

FUNCTION OF A PLASTERED WALL

A plastered wall should be strong, durable, fireproof and should have some insulating and sound proofing effect. It should also be possible to make alterations to its surfaces without leaving any indications. It should also be possible, in most cases, to change the texture and coloring of the surfaces to meet the changing needs of interior decoration.

WOOD LATH

The average dimensions of wood lath are 1/4 in. or 3/8 in. x 1 1/2 in. x 4 ft. They should be clear rough pine, hemlock or other wood that is soft, non-resinous and resistant to warping. They should be applied quite green and full of water. If they are delivered to the job dry, they should be thoroughly wet before being applied.

This type of plaster base causes considerable weight to be added to the building because of the excess plaster used in forming a key between the lath. The labor involved in the application of the lath itself and the additional amount of plaster needed for a wall make this a more expensive job than with some other types of plaster bases. These and other reasons have caused the wood lath to be replaced to a large extent by other types. Wood lath, however, is still a very satisfactory plaster base.

METAL LATH

Metal lath is made by piercing and expanding a metal sheet into a lattice-like sheet which holds the plaster to its surface. It is

obtainable in many weights and shapes to fit the requirements of the areas and the weight of the plaster to be applied. Because of its strength, it is used where protection is needed against cracking, sagging and fire. Metal lath has nothing in it to stain the plaster since it is coated against corrosion and will not show lath marks. It should not be used in areas that are subjected to moisture such as cellars and exteriors, unless the plaster is waterproofed. Metal lath is sometimes used in conjunction with other plaster bases, especially where cracks are likely to occur, such as at internal and exposed corners.

INSULATION LATH

Insulation lath is generally made from ground wood or vegetable fibers compressed into boards of different thicknesses. Some of these boards have metal reinforcement across the joints between the boards to prevent cracks in the plaster at that point. This type of lath makes an excellent base for plaster. The bond is particularly good, and since there are no openings, there is considerable saving in plaster over the type of lath with openings.

Insulation lath has considerable insulating value and will help to prevent heat loss when used on exterior walls and top floor ceilings. However, it provides no barrier to the passage of water vapor. It also provides considerable fire protection.

GYPSUM BOARD

Gypsum board is a plaster base composed of gypsum formed into boards of proper size for convenient and quick installation. It is completely fireproof and provides and effective bond with plaster. It is obtainable in plain and perforated surfaces. It costs no more than wood lath and it eliminates the disadvantages of fire hazard, lath marks, cracks and warping. It also furnishes considerable bracing against wind stresses on outside walls, and is vermin proof.

INSULATING GYPSUM BOARD

Insulating gypsum board combines a plaster base and insulation by taking advantage of the principle of reflective insulation. A sheet of aluminum foil applied to the back of each board at the factory provides an insulation value equivalent to that of $\frac{1}{2}$ in. thick insulation lath but at a lower cost. The aluminum foil is a most effective barrier to the passage of vapor from the room into the wall space.

SELECTED REFERENCES

Audels Carpenters and Builders Guide #4 ..... Graham and Emery
Sweet's Catalog File ..... Dodge Corp.
Building Construction ..... Huntington

HOW TO INSTALL PLASTER BASES

OBJECTIVES OF THE UNIT

1. How to install wood lath.
2. How to install metal lath.
3. How to install gypsum board lath.

INTRODUCTORY INFORMATION

In an effort to avoid difficulties with plaster bases, new materials and new methods of installation have been devised. The amount of labor saved and the likelihood of getting a more dependable plaster job have led to the widespread adoption of these materials and methods. However, wood lath is a satisfactory base if all necessary precautions are followed.

TOOLS AND EQUIPMENT

Hammer
Portable electric saw
Rule
Pencil
Straight edge
Chalk line
Tin snips
Crosscut saw or knife

PROCEDURE

HOW TO APPLY WOOD LATH

1. Nail the lath to the studs, using one nail in each stud. The ends of the lath sometimes require two nails to hold them firmly. The nails are generally 2d or 3d common.
2. Space the lath uniformly 3/8 in. on the ceilings and 1/4 in. on the side walls. Place seven full length lath over a section of the wall to form a panel.
3. Continue forming panels of lath over the entire wall and ceiling surfaces, breaking back the joints of each panel so they stagger over the surface.

CAUTION: Be sure the lath are nailed firmly and that where the lath have a bearing surface of over 2 in., the bearing is chamfered down to 2 in. so that the plaster may form a key over this section.

HOW TO PLACE GYPSUM BOARD LATH

NOTE: Most composition lath comes in panels that are a convenient size to handle, and will fit studs spaced at 12 in. or 16 in. centers.

NOTE: Be sure all the corners and sections of the wall are solidly furred out to give good nailing surfaces for the ends of the plaster base.

1. Nail the lath with the nails specified, and follow the directions given by the manufacturer of the lath base being used. Break the joints on alternate studs, spacing the sheets ¼ in. apart at the ends and fastening them securely to the studs.

2. Lay out and cut panels that are to be fitted around corners and fixtures by using a saw, knife or portable electric saw fitted with an abrasive cutting wheel.

3. Test the outer surfaces of the plaster base with a straight edge for straightness.

4. Apply a 4 in. strip of metal lath in all corners to reinforce the plaster and to reduce cracking. Special strips are sometimes provided for joints between the panels.

5. Apply the metal reinforcing strips, if specified, over the the long joints in the panels by nailing them securely on top of the plaster base and overlapping the joint evenly. If tape or other material is to be used, apply it as specified by the manufacturer.

NOTE: If grounds are to be applied over the plaster base, a straight edge or chalked line should be used to set them in alignment for the interior trim.

DESCRIPTION OF WALL BOARDS

OBJECTIVES OF THE UNIT

1. To describe the types of wall boards.
2. To describe the characteristics of these types.
3. To describe the methods of application of wall board.

INTRODUCTORY INFORMATION

Insulation board is extensively used for the purpose of interior decoration and insulation. Other boards of less insulating value are used for their decorative value alone. Their surfaces may be finished in many textures, colors and shapes to lend beauty to the wall or ceiling. Fiber boards, plaster boards, hard boards, plywoods, and plastic veneers are coming into common use and it is essential that the carpenter know something of their use. These boards are commonly used on walls which are not to be plastered. This is called dry wall construction. Some types provide very inexpensive wall surfaces while others are quite expensive.

FIBER WALL BOARDS

Fiber boards are made of wood or vegetable fibers compressed to form sheets or boards. They come in thicknesses of $\frac{1}{2}$ in. to 1 in., in widths of 4 ft. and in lengths up to 12 ft. The boards are comparatively soft to provide good heat insulating and sound absorbing qualities. The surface is usually rough but some boards are available with finished surfaces. Some boards are scored to divide the surface into squares or other designs. Pieces 6 in. to 16 in. wide and up to 12 ft. long are available. These are called planks. Small individual pieces are also available to give a tiled effect. All of these boards are usually fastened to the studs in such a way that no nail heads show.

PLASTER BOARDS

Plaster board is composed of gypsum between two layers of heavy paper. It comes in thicknesses of 1/4 in., 3/8 in., and 1/2 in., in widths of 32 in., 36 in., and 48 in., and in lengths up to 12 ft. Some types have unfinished surfaces while others have surfaces finished to represent wood grain or tile. If the surface of the unfinished type is to be left exposed and painted, the joints may be covered with strips to form panels. Another method of concealing the joints is to use the type of board with depressed joints which are then filled with a special cement and tape. This wall can then be painted and the joints will not show.

HARD BOARDS

Although these boards are known by several trade names, they are all made by separating and treating wood fibers which are then subjected to heat and heavy pressure. This board is available in thicknessess of 1/16 in. to 5/16 in. The most common size of sheet is 4 ft. x 8 ft. but smaller ones are available. This board may be obtained in a plain smooth surface or in any one of a number of glossy finishes some of which imitate tile or stone. This type of board is often nailed directly over the plaster. It is also applied to furring strips or grounds over a plastered wall. In this case, to avoid drumming noises from the thin board over a hollow space, thick daubs of cement are often applied between the back of the board and the wall surface every 12 in.

PLYWOOD

Plywood for interior walls is made in the same manner and comes in the same sizes as plywood for other purposes. See page 18 of "Concrete Form Construction". The sheets may have no defects on either face (good two sides or G2S), or may have only one face with no defects (good one side or G1S). It may be obtained with faces of walnut, mahogany, gum or other decorative woods. Single veneers or thin two ply panels may be obtained to bend around curved surfaces. Plywood panels are fastened to studs or furring by nailing. The joints may be concealed by covering them with decorative moulding.

SELECTED REFERENCES

Building Construction ..... Huntington

Literature from companies manufacturing wall boards .....

HOW TO APPLY WALL BOARDS

OBJECTIVES OF THE UNIT

1. To show how to apply fiber and decorative insulating boards.
2. To show how to apply plaster boards.
3. To show how to apply hard board and plywood.

INTRODUCTORY INFORMATION

Wall boards are usually applied by the carpenter. Although the application of these boards is simple, there are certain procedures that should be given particular consideration.

TOOLS AND EQUIPMENT

Crosscut saw, 10 pt.
Portable electric saw with and abrasive cutting wheel
Plane
Knife
Scoring plane
Rule
Pencil
Square
Chalk line
Straightedge
Hack saw

PROCEDURE

HOW TO APPLY FIBER BOARDS AND DECORATIVE INSULATING BOARDS

1. Measure the length and width of the ceiling of the room to decide how the panels or units of wall board are to run.
2. Apply furring strips to the joists so that the outside edges of each panel or unit will have a solid nailing surface. The furring strips should be about 16 in. o.c. and should form a straight and true surface.
3. Back up or fur around all edges of fixtures and openings so that the panels or units may be nailed solidly around these edges.
4. Start the first row of panels by snapping a chalked line to keep them square and straight. Cut the board with a hand saw by laying it on two boards laid across two saw horses.
5. Fasten the panels to the furring strips, following the instructions given by the maker of the type of board being used. Use 3d or 4d blued lath nails for nailing edges and tongues. Special fiber board nails should be used where mouldings are to cover the joints. Finishing nails or escutcheon pins with rosette heads should be used for exposed surfaces. Do not use finishing nails for nailing tongue edges.

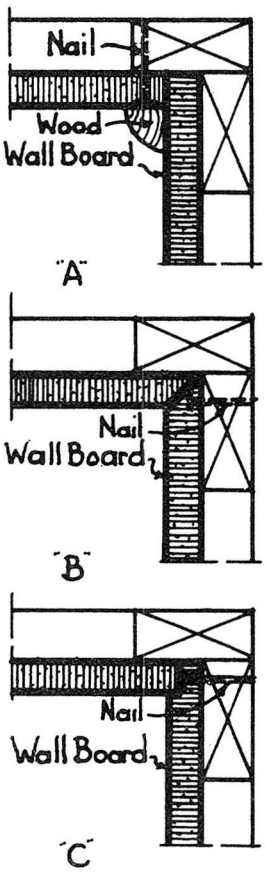
NOTE: These points are important as many wall boards require allowances between the joints. If this is neglected, the boards may buckle after the trim is applied.

It is a good practice to allow the boards to stand in the room for at least one day so that their moisture content may be equalized with that of the room before they are nailed in place.

6. Apply and fasten the boards to the side walls in a similar manner.

NOTE: Some fiber boards are used in large sheets and the required design is scored on the exposed surface with a scoring plane as described in Unit 1C-P8 of "Hand Tools and Portable Machinery".

7. Cut, finish and secure the corner joints by one of the methods shown in A, B or C, Fig. 1.



INSIDE CORNER JOINTS

FIG. 1

HOW TO APPLY PLASTER BOARDS

NOTE: Plaster boards are applied in the same manner as fiber boards. They should be handled carefully so that the edges will not be damaged with a consequent crumbling of the enclosed gypsum. The nail heads should not be pounded below the surface of the board, nor should the sheets be forced into place.

HOW TO APPLY UNFINISHED HARD BOARDS

NOTE: It is assumed that the board is to be nailed over the plaster to form a wainscoting and is to be painted later.

1. Establish a horizontal level line to serve as a guide in laying the sheets. This line should be located at the top of the first course of sheets and should be so placed that the inequalities of the floor level and the height of the baseboard are considered.

2. Cut and fit the boards by using a 10 point crosscut saw or a portable saw with little set in the cutting blade. Remove the burr from the board with a wood rasp.

3. Nail the boards over the plaster to the studs with finishing nails and set the heads.

4. Fill up the nail holes with cement or putty and sand it flush after it has dried.

NOTE: If the board is thin and unscored, it may be bent around a curved surface if the bend is not too sharp.

HOW TO APPLY FINISHED HARD BOARD WITH CEMENT AND METAL MOULDING

NOTE: If the surface of the board is already enameled or otherwise finished, it is often fastened to the plastered wall with cement and metal mouldings.

1. Cut and fit the mouldings and the sheets of hard board. Temporarily assemble them to the wall.

2. Mark the position of the mouldings and then remove both the boards and the mouldings.

3. Apply the cement over the surface of the wall board, keeping it back about 3 in. from the edges.

NOTE: Be sure the wall surface is rough enough to form a key for the cement and that the temperature of the room is not lower than 60 degrees.

4. Replace the metal mouldings and nail them to the wall. Slide the edges of the wall boards into the mouldings.

5. Work the wall board from the fastened edge toward the loose edge, forcing the board tightly to the wall and into the moulding.

6. Temporarily brace the board to the wall for at least 24 hours or until the cement has set. Protect the face of the wall boards with cloth or pads.

NOTE: The following methods of bracing the wall boards may be used.

a. Wedge struts between blocks nailed on the floor and upright boards against the wall board.

b. Wedge struts between uprights on the face of the wall board and the opposite wall.

HOW TO APPLY PLYWOOD

NOTE: Plywood is sometimes applied to the ceilings and side walls before the non-bearing partitions are erected. This method eliminates much cutting and fitting of the panels and adds much strength to the frame of the house.

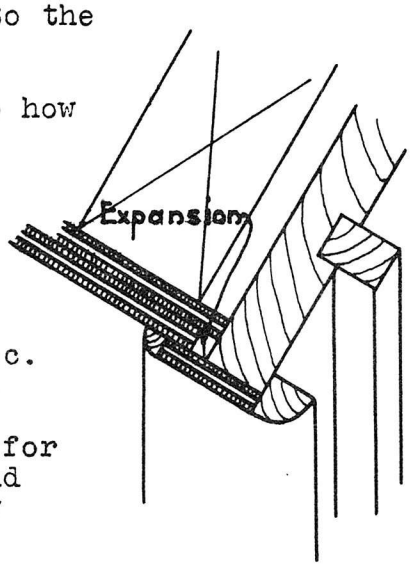
1. Plan the layout of the panels according to the size of the room.

2. Fur out the joists and studs according to how the panels are to be arranged.

3. Nail the panels to the studs, joists or furring strips. Use 4d casing nails if the plywood is 1/4 in., 6d nails if it is 3/8 in. to 1/2 in. and 8d nails if it is over 1/2 in. thick. Space the nails along the edges 6 in. o.c., and 12 in. o.c. on studs between the edges of the panels.

   NOTE: Figure 2 shows how to use plywood for furring on the face of the stud and also the use of plywood for window casings.

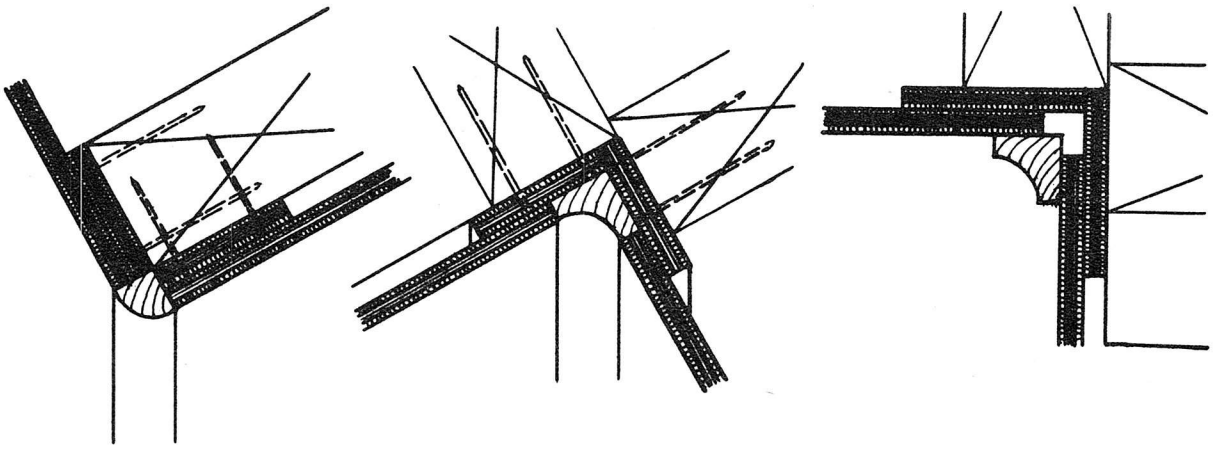
   Do not butt the joints of the plywood tightly together but allow from 1/8 in. to 1/4 in. for expansion. This is particularly true near window trim.



PLYWOOD WINDOW TRIM

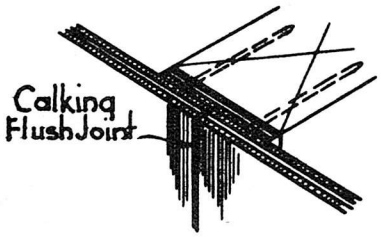
FIG. 2

4. Use mouldings at corners formed by the walls as shown in Fig. 3.



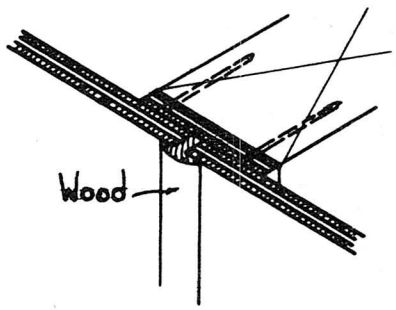
FINISHING CORNERS

FIG. 3



FLUSH JOINT

FIG. 4



MOULDED JOINT

FIG. 5

5. Use caulking compound to fill joints as shown in Fig. 4. This may be made by mixing plaster with shellac to a consistancy of putty to fill the joints. Allow it to dry about 3 hours and then sand to a finish.

NOTE: Figure 5 shows another method of forming horizontal or vertical joints between the panels. Tight butt joints directly nailed over studs are never satisfactory. Use furring strips nailed to the studs and tight moulded joints glued to the furring strips wherever possible.

DESCRIPTION OF INTERIOR DOOR JAMBS

OBJECTIVES OF THE UNIT

1. To describe a door buck.
2. To describe a door jamb.
3. To explain the layout of bucks and jambs.

INTRODUCTORY INFORMATION

Wherever there is to be a doorway in a masonry or frame wall, a wooden frame should be provided upon which to fit and swing the door and fasten the interior trim. If the frame is for a wood partition, it is generally made of finished lumber and to the finish dimensions of the door. This type is called a door jamb. In case the door opening is in a masonry wall, a door buck or false jamb is provided to guide the mason in laying up the masonry and to which a separate finished jamb may be fitted.

DESCRIPTION OF A DOOR BUCK

Door bucks are generally made of rough stock 1 5/8 in. thick and as wide as the masonry wall plus the thickness of the furring and the plaster coats on the inside of the wall.

They are made in much the same way as the head and side jambs of a cellar frame but the sill is omitted. There is a temporary brace to hold the buck at this point. The buck is further braced to hold it square and it is then erected in the wall and braced in a plumb and level position.

Provision is made for anchoring the buck in the masonry wall by placing wooden blocks in the wall as it is being laid up. The buck is nailed to these blocks after the wall is set and before the braces are taken off the buck (Fig. 1). Metal anchors are also used for this purpose. If the buck is set on a masonry floor, the bottom ends of the buck are anchored to the floor as shown in Fig. 1.

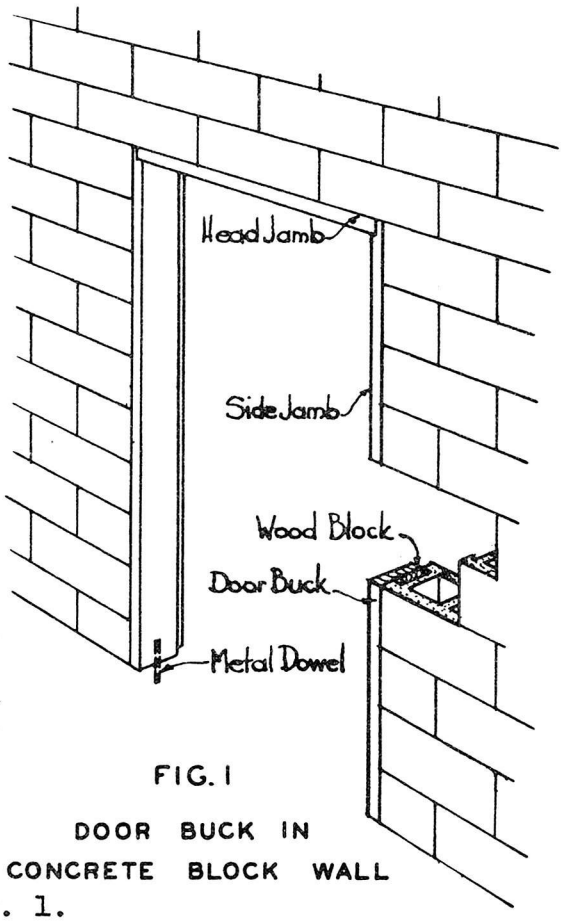


FIG. 1
DOOR BUCK IN CONCRETE BLOCK WALL

This figure shows a buck placed in a concrete block wall where casings are not required.

Figure 2 shows a combination door buck and jamb in a masonry wall that is wider than the jamb. An outside casing provides a recess for a storm or screen door. The buck is kept flush with the inside plaster line and finished with a door casing as shown.

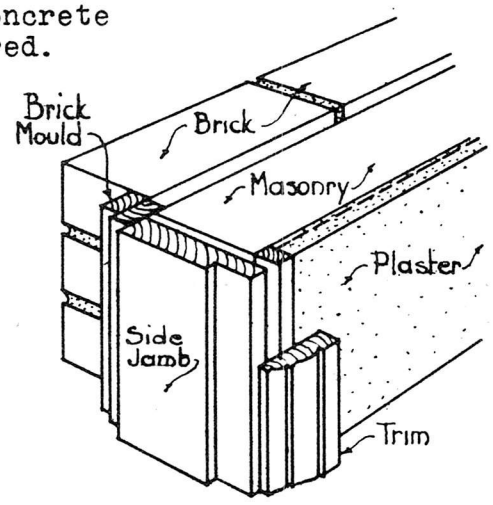


FIG. 2

DOOR JAMB IN MASONRY WALL

DESCRIPTION OF INTERIOR DOOR JAMBS

Interior door jambs are framed in the same general way, but are made of finished stock of the same material as the interior wood trim.

The thickness of such a jamb is 25/32 in. or 1 1/16 in. and the width is the same as the thickness of the finished partition at the door opening. The head and side jamb members are straight stock with a plain face. The door may then be hung from either side of the assembled jamb frame. Such jambs are laid out according to the dimensions of the door, and assembled, squared and braced on a bench. They are later set and plumbed in position in the door opening of the partition.

HOW TO BUILD AND INSTALL DOOR JAMBS AND BUCKS

OBJECTIVES OF THE UNIT

1. To show how to build door bucks.
2. To show how to build door jambs.
3. To show how to install bucks and jambs.

INTRODUCTORY INFORMATION

Door bucks and jambs properly made and set are a very important factor in the satisfactory operation and life of a doorway. In some cases the jambs are cut and assembled in the mill while in others, the carpenter makes the jambs on the job.

TOOLS AND EQUIPMENT

Hammer
Crosscut saw, 10 pt.
Steel square
3/4 in. chisel
Straight edge
Spirit level
Rule
Plane

PROCEDURE

HOW TO BUILD A DOOR BUCK

1. Measure the thickness of the masonry wall and select stock 1 5/8 in. thick and as wide as the wall is thick. Cut the stock for the header and sides of the jamb frame, allowing 3 in. extra on the length.
2. Plane the face and edges straight and smooth.
3. Determine the height of the header from the floor and lay out the dado joint in the side jamb. This is done in the same way as for the basement frame.
4. Lay out a right and left hand side jamb and cut the dado joints 3/4 in. deep.
5. Lay out and square both ends of the head jamb to a length 1½ in. longer than the width of the door that is to be used in the opening.
6. Assemble the head and side jambs. Keep the edges flush and drive three 16d common nails in each dado joint.
7. Brace the assembled jamb as shown in Fig. 1. Put on the cross brace first keeping the two side jambs the same distance apart

at the bottom and top of the frame. Hold the jamb square with a diagonal brace solidly nailed.

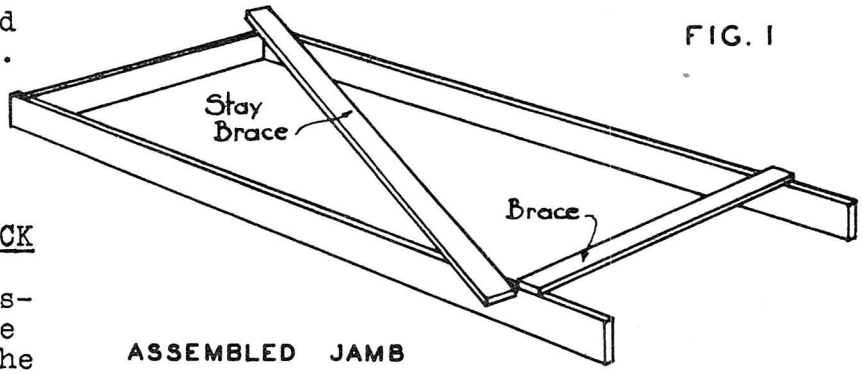


FIG. 1

ASSEMBLED JAMB

HOW TO SET A DOOR BUCK

1. Determine the distance between the bottom face of the head jamb and the top of the finish floor. This distance may also be found by measuring the height of the door that is to be used.

2. Check the levelness of the floor across the door opening.

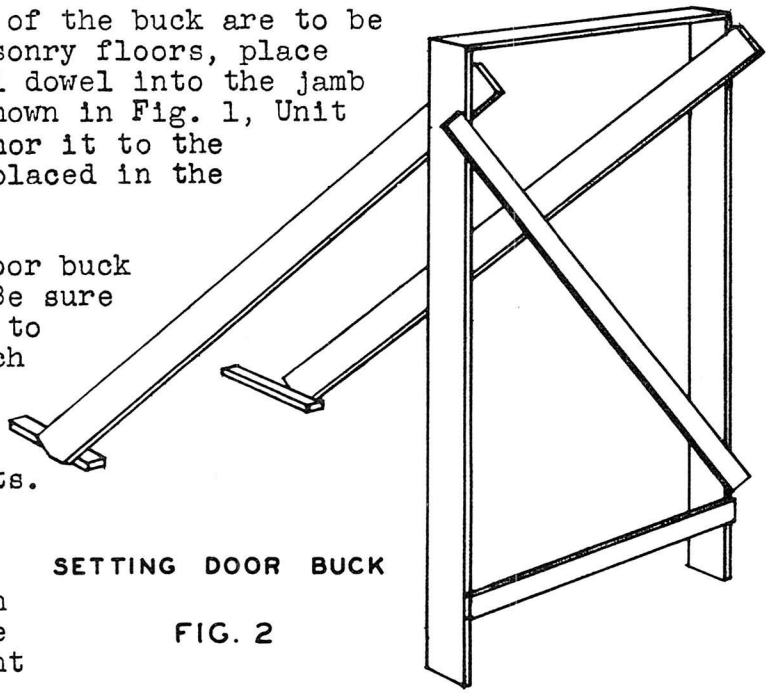
3. Mark the two side jambs to the length found in step 1. If the floor is level at the opening, cut the side jambs off at these marks. If the floor is not level, determine the low side and allow this difference on the length of one side jamb.

4. Place the door buck in the opening and center it according to the dimensions given on the floor plans and the thickness of the wall.

   NOTE: If the bottoms of the buck are to be anchored to masonry floors, place a 1/2 in. metal dowel into the jamb and floor as shown in Fig. 1, Unit 1C-T70, or anchor it to the wooden blocks placed in the masonry wall.

5. Brace and plumb the door buck as shown in Fig. 2. Be sure the braces are nailed to solid wood members such as floor joists or blocks of wood spiked through the subflooring and into the joists.

6. Check the head to see if it is square with the side jambs at each corner. Test the side jambs with the straight edge. If they are



SETTING DOOR BUCK

FIG. 2

bowed, bring them into alignment and place braces to hold them in position.

NOTE: Figure 2, Unit 1C-T70 shows a door buck that is set flush with the inside of the wall so that a casing may be nailed to the edge of the buck and also to the plaster ground on the wall. The outside edge of the jamb is finished by running a casing and brick mould from the edge of the jamb to the masonry wall. This type of buck should be erected and braced before the wall is laid up. Nailing blocks would also have to be set in the wall. The procedures are the same as previously described.

HOW TO BUILD AND SET INTERIOR DOOR JAMBS

1. Select the door jamb stock and lay out the head and side jambs in the same way as for door bucks.

2. Cut the dado joints 3/8 in. deep if the jamb stock is 25/32 in. thick and 1/2 in. deep if it is 1 1/16 in. thick.

3. Determine the distance that the bottom face of the head jamb is to be from the finished floor. This distance is often measured from the height of the window jambs and the door jambs made to line up with the window jambs.

4. Mark this distance on each side jamb.

5. Joint the side and head jambs to the width of the partition, beveling them about 1/16 in. so that the casings will fit tightly against the edges of the jamb. See Fig. 3. Sometimes the casings are beveled and it is not necessary to bevel the edges of the jambs.

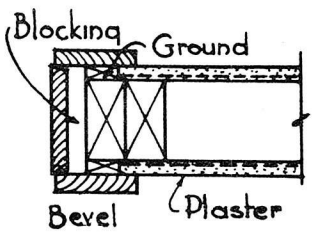
6. Assemble the head jamb and side jambs.

7. Set the assembled jamb temporarily into the door opening and level it.

8. Mark the cut on the side jambs as described under "Door Bucks".

9. Remove the jamb and cut the side jambs to length.

10. Nail 3/4 in. x 3 in. blocks about 14 in. apart up the hinge side of the door opening. The blocks should be as long as the jamb is wide. Arrange the blocks so that one will



SETTING INTERIOR DOOR JAMBS

FIG. 3

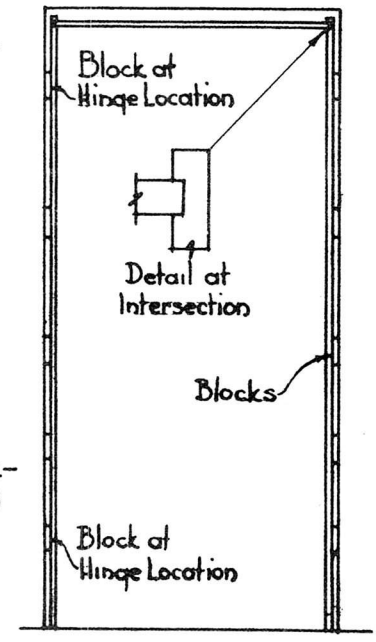
be placed behind the hinges of the door to form a solid base back of the hinges (Fig.4).

11. Place the jamb against these blocks. Place a small block of finished flooring under the bottom end of this side jamb if the finished floor has not been laid.

12. Plumb this jamb, keeping it flush with the faces of the finished plastered wall. Nail the jamb temporarily at the top and bottom.

13. Test the face of the jamb with the straight-edge. If it is straight over its entire length and flush with both walls fasten it to the blocks by toenailing it with 8d finishing nails through the edges of the jamb. Set the nails and be careful not to mar the jamb with hammer marks.

14. Place blocks in a similar fashion at the opposite side of the door opening. Cut a small strip of wood as long as the inside width of the jamb at the head. Place this strip between the two side jambs at the floor line.



BLOCKING AT DOOR JAMB
FIG. 4

15. Place the loose side jamb on top of a block of finish floor the same as at the nailed jamb.

16. Square the head jamb with the jamb that is nailed to the blocks. If it is square, temporarily nail the loose jamb to the blocks at the top and bottom.

17. Wedge behind all the blocks with shingles at least 2 1/2 in. wide.

NOTE: If the opening between the back of the jamb and the face of the blocks is about 1/2 in., it may be filled by wedging shingles from both sides of the wall. Point the thin edges toward each other and wedge them until they fit tightly against the back of the jamb. Do not force the shingles but bring the jamb into alignment with the straight edge and the strip at the bottom of the jamb.

18. When the jamb is straight, toenail it into the blocks. Straighten the head jamb in a similar way.

CAUTION: Re-check both side jambs for straightness and plumbness as one side of the jamb is often disturbed or bowed when the nails are driven home and set.

TYPES OF DOOR TRIM

OBJECTIVES OF THE UNIT

1. To describe the plain door casing.
2. To describe the cabinet head casing.
3. To describe the moulded casing.
4. To describe the back band casing and door stops.

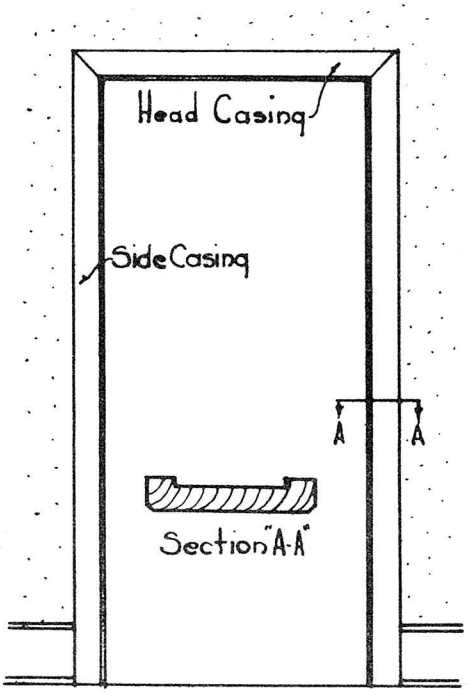
INTRODUCTORY INFORMATION

The design of all interior trim used in most modern houses is quite simple. The more elaborate casings which were difficult to build and to keep free from dust have been replaced by narrow straight line trim. The description of interior casings in this unit will be limited to the plain, moulded and cabinet head types and the method of applying them to door and window frames.

PLAIN CASINGS

A door casing is the wooden trim attached to both sides and to the head of the door jamb. Its primary uses are to protect the edges of the plaster at the door openings, and to form an ornamental finish for the door jamb. It also furnishes a surface to which the base may be fitted.

Figure 1 shows a plain casing using dimensioned and surfaced boards. The material is usually 25/32 in. x 3 5/8 in. to 4 5/8 in. pine or other wood suitable for interior trim. The outside edges are rounded and the back is cupped to permit a tight fit between it and the plastered wall. See Section A-A, Fig. 1. The side and head casings are connected with a mitered joint. This joint should be fastened with a spline and glued. This helps to overcome the tendency of this type of joint to open up and show a crack. The plain casing may be assembled with a butt joint instead of a miter joint. In this case, the head casing is made thicker than the side casing. The resulting slight overhang tends to conceal the joint.



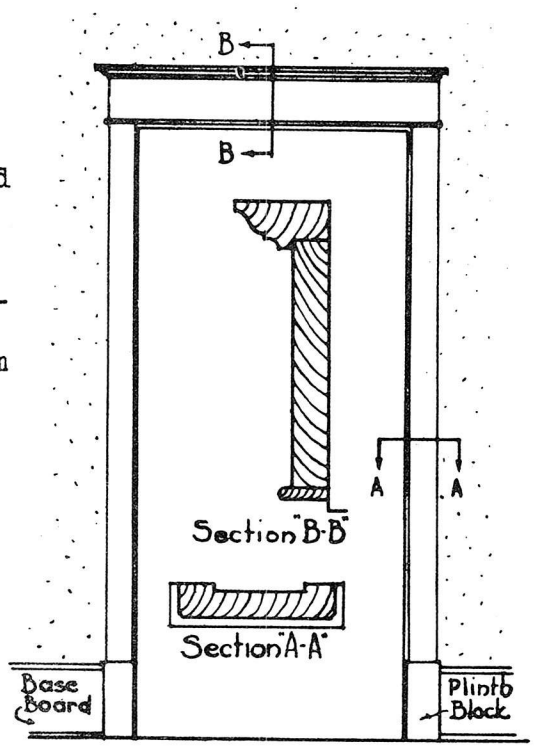
MITERED CASING

FIG. 1

CABINET HEAD CASING

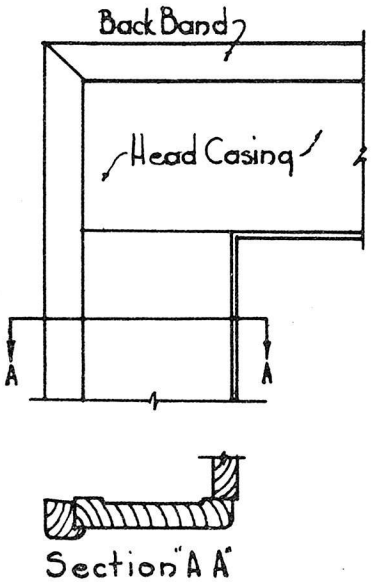
Figure 2 shows plain side casings butting against the bottom edge of a cabinet head casing. A fillet 1/4 in. x 1 1/16 in. rounded on one edge is used for the bottom member. This tends to conceal the butt joint of the side and head casings. The fascia board is 25/32 in. x 5 5/8 in. and the cap moulding is 1 1/16 in. x 2 5/8 in. A small moulding is sometimes used at the bottom edge of the cap moulding. All members are returned around the corner as shown in Fig. 2.

This figure also shows how plinth blocks may be used at the floor. These blocks are generally 1 1/16 in. thick, slightly wider than the door casing and about 1 in. higher than the baseboard. They are nailed to the door jamb the same as the casing and form a surface to which the casing and the baseboard may be fitted.



CABINET HEAD CASING

FIG. 2



CASING WITH BACK BAND

FIG. 3

CASINGS WITH BACK BAND

Frequently, a back band is used around a casing (Fig. 3). This is a special rabbeted moulding that fits over the outside edge of the casing and is mitered at the corners. It extends down to the floor and is nailed to the edge of the casing. It may be plain as shown or it may be moulded. Since the back band projects farther from the wall than the baseboard, a flush joint is avoided at this point and the appearance of this section of the trim is improved. When a back band is used, the side casing is usually butted against the head casing (Fig. 3).

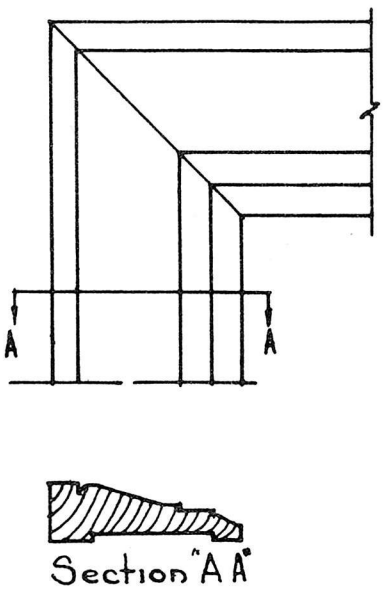
MOULDED CASINGS

A moulded casing may have only one edge shaped to a moulding or the entire surface may be moulded (Fig. 4). The latter type is usually fitted together with a miter joint,

preferably splined. The side casing moulded only on the inside edge may be fitted to a similar head casing by a coped joint or, if the bottom edge of the top casing is square, the side casing could be butted to it. A back band is often used with this type of casing.

DOOR STOPS

Door stops are fitted to the head and side jambs in such a position that they will stop the door at its proper position on the door jamb. They are generally about 1/2 in. thick and 1 1/2 in. wide. If the edge of the casing is rounded, the outside edge of the stop is usually rounded. If the edge of the casing is moulded, the edge of the stop is moulded. One edge of the stop is square to fit against the surface of the door.



MOULDED TRIM

FIG. 4

SELECTED REFERENCES

Good Practice in Construction .... Knobloch

Carpentry and Joinery Work ..... Burbank

HOW TO FIT AND INSTALL DOOR CASINGS

OBJECTIVES OF THE UNIT

1. To show how to fit and install a plain casing.
2. To show how to fit and install a cabinet head casing.
3. To show how to install back band and moulded casings.

INTRODUCTORY INFORMATION

Since defects in the appearance of the interior trim are very apparent, it must be selected and installed with great care. There must be no dents in its surface and all joints must be tight and permanent. Exposed nail holes should be as few as possible because each one must be filled up prior to the finishing coats. This trim is generally applied before the flooring is laid.

TOOLS AND EQUIPMENT

Crosscut saw, 10 pt.	Hard pencil	Nail set
Rip saw	Rule	Sandpaper
Combination square or miter box	Casing hook	Chisel
	Hammer	Block plane

PROCEDURE

HOW TO FIT PLAIN CASINGS

NOTE: Assume that the casings shown in Fig. 1, Unit 1C-T71 are to be fitted and installed and that the casing stock is dimensioned and sanded.

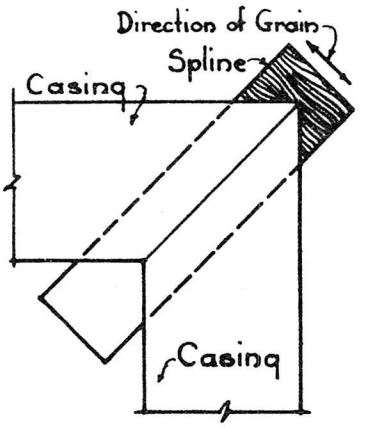
1. Select straight casing stock, and lay off the lengths for the side and head casings. Allow enough material for the joints.
2. Cut the bottom ends of the two side casings square.
3. Place one in position on the side jamb. Allow a margin of 3/16 in. between the edge of the casing and the edge of the jamb.
4. Mark a point 3/16 in. above the bottom face of the head jamb on the inside edge of the casing. This point shows the short end of the 45 degree cut to be made at the top of the casing. Mark the two side casings in this manner.

NOTE: A convenient way of scribing a true margin along the edge of the jamb is to set the combination square so that the blade projects 3/16 in. beyond the face of the square head. The square then may be used as a gauge to mark the margin.

5. Place the head casing in position on the head jamb. Allow a 3/16 in. margin and mark a point on the inside lower edge of the casing 3/16 in. beyond the inside edge of the side jamb. Mark both ends of the head casing in the same way. These points show the short end of the miter cuts. Mark the miter cuts.

6. Cut the miters on the casings in the miter box and finish the surfaces with a plane if necessary.

7. Form a kerf for the spline in the miter cuts by running a saw cut in the edge of the miter to a depth of 1 in. (Fig. 1).



SPLINED MITERED JOINTS

FIG. 1

NOTE: This may be conveniently done with a portable electric saw. The saw blade should have set so as to form a saw kerf of about 3/16 in. or a double cut may be made by running the saw through, first with the fence against one face and then with it against the other. A hand rip saw may also be used for this purpose.

8. Make a spline about 1/4 in. x 6 in. x 2 in. and fit it into the kerfs of both parts of the mitered joint. Assemble the joint to see if the spline is fitted properly and holds the joint together. If it does not, refit the spline.

NOTE: Special splines of metal or wood may be purchased for this purpose. There are also several fasteners that may be used.

9. Nail the side casing to the edge of the side jamb with 8d finishing nails, starting at the bottom. Space the nails about every 14 in. and maintain the 3/16 in. margin as the nails are being driven.

NOTE: In trying to maintain the 3/16 in. margin, be sure the jamb is not pulled out of line. Sometimes even a nail driven in with too much slant will pull the jamb out of alignment.

10. Nail the opposite edge of the casing to the grounds and studs keeping the nails opposite those driven into the jamb. Set the nails.

NOTE: In spacing the nails, be sure not to locate a nail where the lock strike plate will come in the jamb.

11. Nail the opposite side casing in the same manner.

12. Cover the splines with glue and place them in the miter cuts of the head casing.

13. Slip the casing in place and nail it the same as the side casings. Slant the nails driven into the studs so the miter joint will be pulled up tight.

14. Trim the edges of the spline off flush with the casing edges with a sharp chisel and sand the edges smooth.

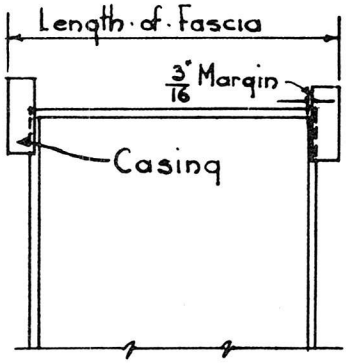
HOW TO BUILD AND FIT A CABINET HEAD CASING

NOTE: Cabinet head casings are generally built as a unit on a bench, fastened in place on the head jamb and the side casings are then fitted to them.

1. Place a small piece of side casing in position on each of the side jambs and mark the outside edges on the plaster wall. The distance between these two marks is the length of the fascia. See Fig. 2.

2. Mark and cut the fascia to length and plane the end grain smooth.

3. Cut the fillet to length, allowing it to to project ½ in. over each end of the fascia. Round off the ends the same as the edge.



LENGTH OF CABINET HEAD

FIG. 2

4. Cut the cap moulding long enough to project over each end of the fascia so that it may be returned.

5. Make a return on each end of the cap moulding.

NOTE: The return may be formed by mitering a short piece to each end or the cap may be returned on its own profile.

6. Nail the cap moulding on the top edge of the fascia with 8d finishing nails. Keep the square edge of the moulding flush with the back of the fascia. See Section B-B, Fig. 2, page 145.

7. Cut, fit and nail the pressed moulding if one is needed. Nail the fillet with 1½d finishing nails to the bottom edge of the fascia, allowing it to project ½ in. over each end of the fascia. The square edge should be flush with the back of the fascia.

8. Set the nails and sand the whole cabinet head.

9. Nail the cabinet head with 8d finishing nails to the head jamb, keeping the fillet parallel to the head jamb and showing a 3/16 in. margin on this jamb. The ends of the cabinet head should be in line with the marks on the plastered wall.

HOW TO FIT CASINGS TO A CABINET HEAD

NOTE: Figure 2, Unit 1C-T71 shows a cabinet head with plinth blocks and casings.

1. Select plinth block stock approximately 1 1/16 in. thick and a little wider than the side casing and longer than the height of the baseboard.

2. Lay out and cut two plinth blocks to size. Slightly round off the top outer edge and sand the surfaces that will show when the block is placed.

3. Nail the block to the door jamb and grounds with 8d nails, leaving a margin of 1/8 in. between the edge of the block and the face of the jamb. The bottom of the block should be even with the top of the finished floor. Fasten a block on the opposite jamb in the same way.

4. Select the two side casings. Square the bottom ends and place the squared end of one casing on top of a plinth block and the back of the top end against the fillet of the cabinet head as shown in Fig. 3.

5. Slip a base hook over the casing and along the bottom side of the fillet. Hold it tightly against the fillet and mark the face of the casing along the top side of the hook with a hard well sharpened pencil.

6. Saw along the line with a fine crosscut saw.

7. Replace the casing on the jamb and line it up so that it shows a 3/16 in. margin. Inspect the top and bottom fits. If they are correct, nail the casing. Repeat these operations on the opposite jamb.

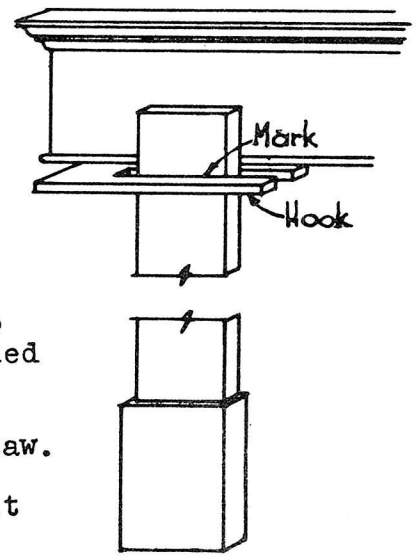


FIG. 3

METHOD OF MARKING LENGTH OF CASING

HOW TO FIT MOULDED CASINGS

NOTE: The most common method of fitting moulded casings is to miter and

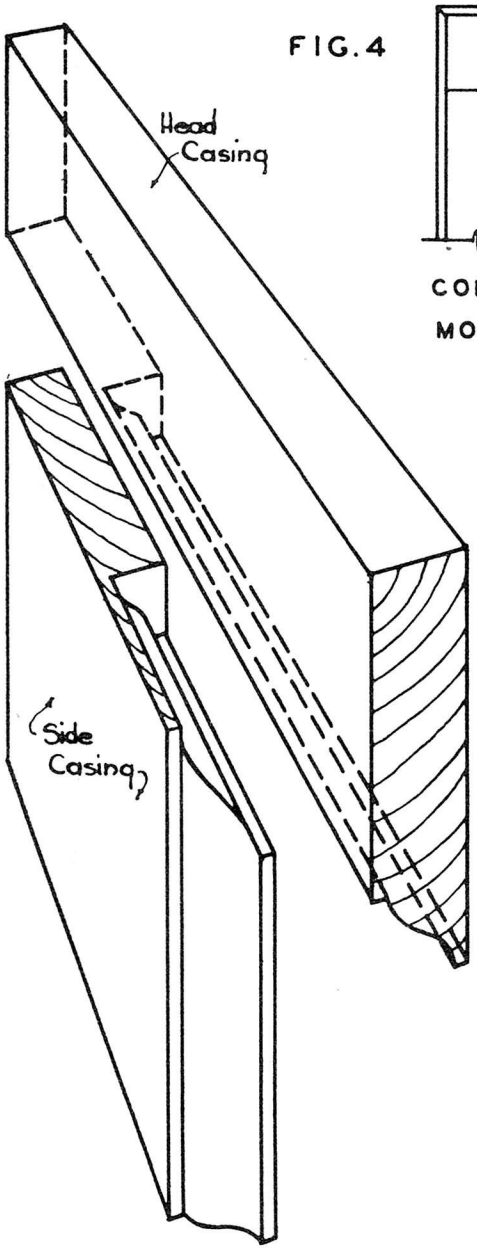
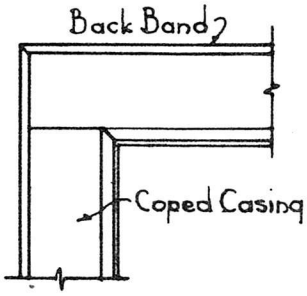


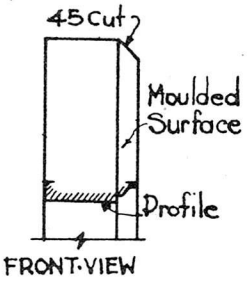
FIG. 4

CUTOUT BEAD AND COPED SIDE CASING

FIG. 6



COPED FLAT AND MOULDED CASING



COPED CASING

FIG. 5

spline the joints at the intersection of the head and side jambs.

Some casings, especially those used with a back band, have a flat surface and a moulded edge such as shown in Fig. 4.

1. Select the head casing stock and cut it off to the proper length as shown in Fig. 2. Cut out the ends of the head casing as shown in Fig. 6.

2. Set the head casing in place on the head jamb with a 3/16 in. margin and nail it.

3. Cut a miter on the moulded surface of the side casing (Fig. 5). The cut will show the profile of the moulded surface. Cut and carve along this line to the flat surface of the casing so that the coped surface will fit against the curved surface of the head casing. Cut the flat surface square so that it will fit against the cut out part of the bottom edge of the head casing (Fig. 6).

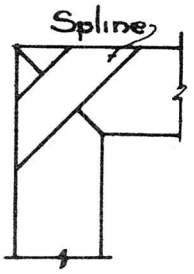
4. Cut the bottom end of the casing to fit the plinth block or finished floor as the case may be.

5. Select the back band stock for the head and side casings. Measure the length from the plinth block or

floor to the top of the head casing. This gives the short cut of the miter for the back band. Cut the miter in a miter box and nail the back band in place. Cut, fit and nail the opposite back band in the same way.

6. Fit the top back band between the miter cuts of the side back bands and nail it in place.

NOTE: Sometimes in using moulded casings that are to be mitered at the head casing, it is difficult to provide a spline such as shown in Fig. 1 because the casing is too thin. If this is the case, a spline may be rabbeted into the back of each casing at the miter as shown in Fig. 7.



RABBET SPLINE AT MITER

FIG. 7

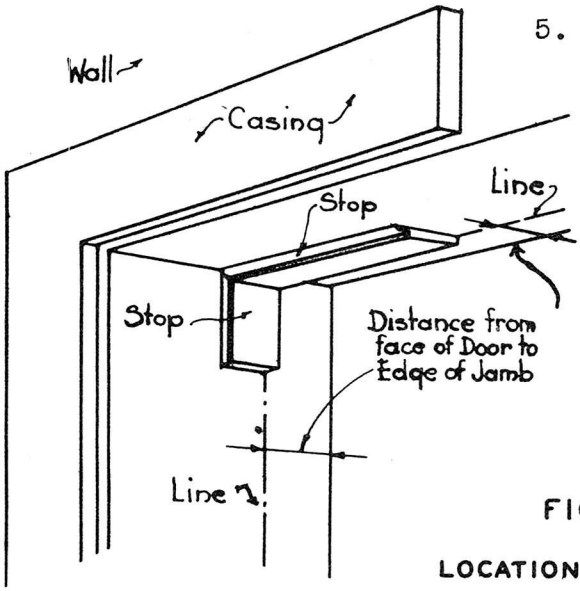
HOW TO FIT AND INSTALL DOOR STOPS

1. Select the door stop material and cut the head stop to fit between the two side jambs.

2. Cut door stops for both side jambs long enough to reach from the head jamb to the bottom of the side jamb.

3. Cope the top ends of the side stops so that they fit the contour of the head stop.

4. Mark the thickness of the door on the face of the head and side jambs as shown by the line in Fig. 8.



5. Temporarily nail the head and side stops in place along these marks. When the door is closed, the square edge of the stop should be against the face of the door.

NOTE: After the door has been hung and the lock fitted, the stops may be adjusted so that the door will close properly and will not rattle.

FIG. 8

LOCATION OF STOPS

DESCRIPTION OF WINDOW TRIM

OBJECTIVES OF THE UNIT

1. To describe the members used in window trim.

2. To describe the methods of fitting window trim.

INTRODUCTORY INFORMATION

Window side and head casings are generally of the same design as the door casings. The door trim consists of two sides and a head casing whereas the window trim includes these casings together with the sill trim. The description of the side and head trim for windows will therefore be omitted. Only the sill and stop bead will be considered.

DESCRIPTION OF WINDOW TRIM

The plain, moulded, back band and cabinet head styles of trim as described for doors in Unit 1C-T71 are the same for windows. Figure 1 shows the window trim on a double hung window. It is fitted to the top of the stool in the same manner as the door trim is fitted to the floor. The edges of the casings are flush with the jamb instead of showing a margin of 3/16 in. as in door casings.

The stool is generally 1 1/16 in. x 3 1/2 in. and extends beyond the sides of the side casings as shown. It is rabbeted to fit the bevel of the sill and to provide a level top upon which the side casings may be fitted.

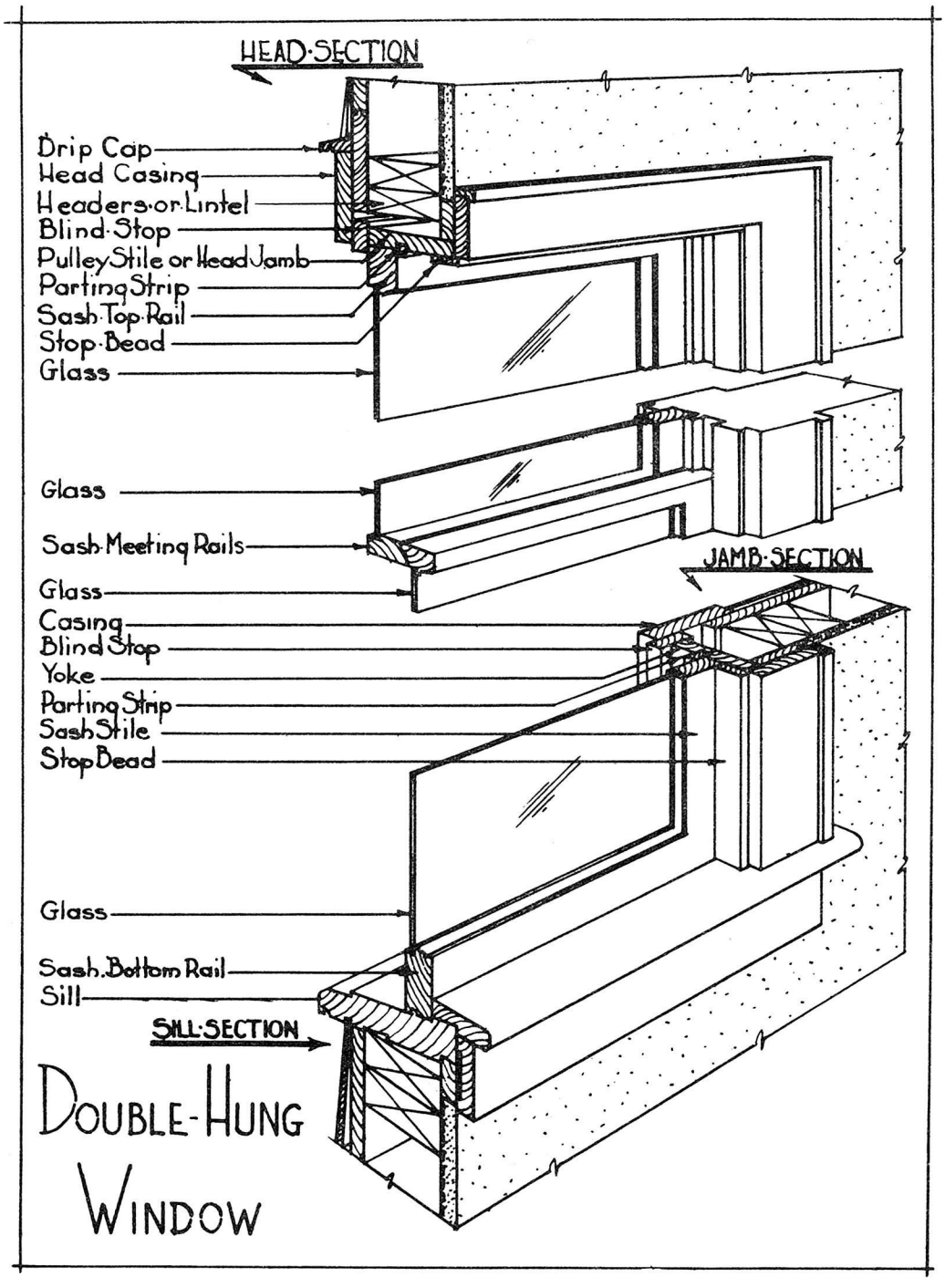
The stop bead, which is usually 1/2 in. thick and 1 1/2 in. wide, forms one edge of the runway for the lower sash. It is applied to the head and side jambs. The joints at the two corners may be coped or mitered and the lower end butts against the stool.

The apron serves as an added support for the stool and a means of forming a trim at the bottom of the window opening. It is generally made up of 25/32 in. stock and dimensioned to correspond to the side casings of the window trim.

SELECTED REFERENCES

Carpentry and Joinery Work ..... Burbank

Millwork catalogs .....



DOUBLE HUNG WINDOW

FIG. 1

HOW TO FIT AND APPLY WINDOW TRIM

OBJECTIVES OF THE UNIT

1. To show how to fit a window sill.
2. To show how to fit a window stop bead.
3. To show how to scribe casings.

INTRODUCTORY INFORMATION

The application of window trim is similar to that of door trim. However, fitting the stool on the sill varies slightly according to the type of sash operation. For instance, the casings and stool of a double hung window would be fitted differently than those of the casement frame.

TOOLS AND EQUIPMENT

Crosscut saw
Combination square
Hammer
Nail set
Jack plane
Scriber
Coping saw
Rip saw

PROCEDURE

HOW TO FIT A STOOL FOR A DOUBLE HUNG WINDOW

1. Select clear stool stock. Square off one end.
2. Round this end with a plane to correspond to the profile of the front edge of the stool. Take a fine cut and work across the end grain from the front edge of the stool.
3. Measure the distance the ends of the stool are to extend beyond the inside faces of the jambs and mark these points on the plastered wall. The stool should extend beyond the outer edge of the side casing the same distance it will project beyond the stool in front.

NOTE: If the window is of the casement type, 3/8 in. would be added to the stool to allow for a margin 3/16 in. on each side at the inside of the casings.

A templet may be made to hook over the jamb of the window frame. Notches may be made in the templet so that the location of the outer edge of the casing and the end of the stool may be quickly and accurately marked on the wall at both sides of all the window openings, thus avoiding successive measurements. See Fig. 1.

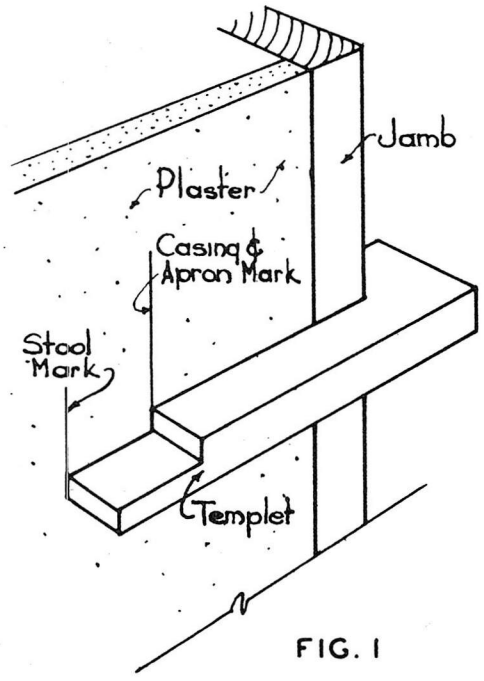


FIG. 1

TEMPLET FOR SILL TRIM

4. Cut the stool to the same length as the distance between the two marks on the wall and round off the second end.

5. Place the stool against the window jambs at the sill line. Keep the ends of the stool even with the stool marks on the wall.

6. Place the combination square blade against the inside face of the window jamb and on top of the window stool. Mark along the blade and on the top of the stool as at A, Fig. 2. Mark the other end in the same way.

7. Set the scriber to the distance between the square edge of the stool and the inside of the bottom sash rail (B, Fig. 2).

NOTE: Be sure the sash is down to the sill and that it is tight against the parting strip.

8. With one end of the scriber against the wall, scribe the top surface of the stool, making a mark as shown at C. Mark both ends of the stool in the same way.

9. Cut along the lines C with a rip saw. Use a crosscut saw to cut along line A. Cut out the other end in the same way.

10. Replace the stool on the sill and trim it so that it fits against the sash and the wall surface.

11. Move the lower sash up and down to see that it does not hit the stool edge. The distance between the sash and the stool should be no greater than 1/16 in. or a double thickness of sandpaper.

12. When the stool fits properly, nail it to the window sill, using 8d casing nails about 10 in. apart.

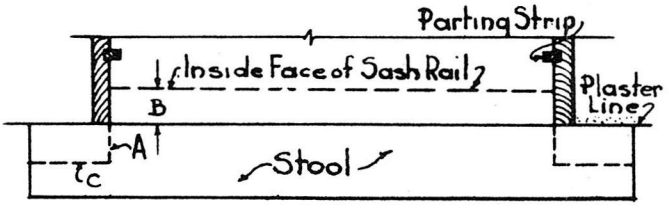


FIG. 2 STOOL LAYOUT

HOW TO FIT THE SILL APRON

1. Select the apron stock and cut it to length. This length should be the same as the distance between the two marks on the wall which represent the outside edges of the side casings (Fig. 1).

   NOTE: If the apron is of a moulded type, return the profile on the ends.

2. Place the apron in position on the window sill and even with the marks made on the wall for the ends of the apron (Fig. 1).

3. Fit the apron to the bottom of the stool and nail it in place. Insert nails at the top of the apron into the sill also at the bottom into the subsill of the rough window opening. Use 6d finishing nails spaced 14 in. apart.

   NOTE: Be sure the stool is level both ways before nailing the apron and that the apron does not crowd it up as it is being nailed.

4. Fit the side and head casings in the same way as those of the door. However, the edges of the casings come flush with the inside surface of the window jambs. The nails in the side casings should not be driven into the removable pocket of the side jambs. The head casing is the same length as the apron.

HOW TO FIT THE STOP BEAD

1. Select the head stop bead material and cut it to fit in between the faces of the side jambs.

2. Fit it into place and nail it temporarily.

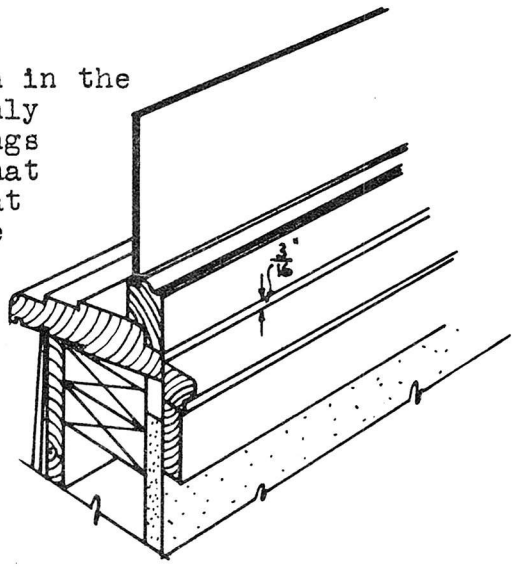
3. Cut the side stop beads so that they extend from the top of the stool to the underside of the window head jamb. Leave them 1/16 in. long and cope the top ends to fit against the head stop bead.

4. Adjust the side stop bead so that a double thickness of sandpaper will fit between the lower sash and the stop bead. Temporarily nail it in this position and move the lower sash to the top and bottom of the frame to see if the stop is the same distance from the sash the full height of the frame.

5. After the two side stops have been properly adjusted, nail them with 1 1/2 in. brads spaced 10 in. Nail the top stop to line up with the side ones.

HOW TO FIT THE STOOL OF A CASEMENT WINDOW

NOTE: An inswinging casement is shown in the sill section of Fig. 3. The only difference in fitting the casings and stool of this frame from that of the double hung frame is that the stool is butted against the inside edge of the window sill and a margin of 3/16 in. is left between the top of the sill and the top of the sill stool. The side and head casings also show a margin at the jamb rather than being flush as in the double hung frame.



INSWINGING CASEMENT

FIG. 3

1. Select the stool stock and cut it to length the same as for a double hung frame.
2. Form the returns on the ends.
3. Rip the stool to fit the edge of the sill. Allow the front edge and the ends to project over the face and ends of the apron the same distance as in the double hung frame.

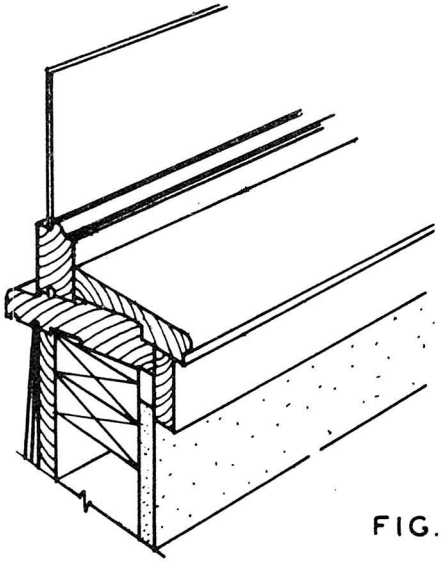


FIG. 4

OUTSWINGING CASEMENT

4. Nail the stool to the sill temporarily. Fit the apron and nail it permanently in place. Nail the stool permanently by driving 8d finishing nails through the edge into the sill. It should also be nailed to the apron.
5. Secure the head and side casings.

NOTE: An outswinging casement frame is shown in Fig. 4. This type frame is cased in the same way as the double hung frame except that an extra wide stool is provided.

TYPES OF BASEBOARDS

OBJECTIVES OF THE UNIT

1. To describe types of baseboards.
2. To describe methods of forming joints and of installing baseboards.

INTRODUCTORY INFORMATION

A baseboard may be a plain single board or it may be a built-up type that consists of a moulding fitted to the top of a plain board. It may also be a plain board with a moulded top edge. The design of the baseboard should be in harmony with the door and window casings of the room in which it is used.

DESCRIPTION OF PLAIN BASEBOARDS

Plain baseboards may be from 4 in. to 8 in. wide and are generally 25/32 in. thick. The wide single piece base is generally hollowed out at the back to avoid warping and twisting and to make it easier to fit it to the plastered wall. The top is slightly rounded off. Figure 1 shows this type of baseboard in place on the plastered wall.

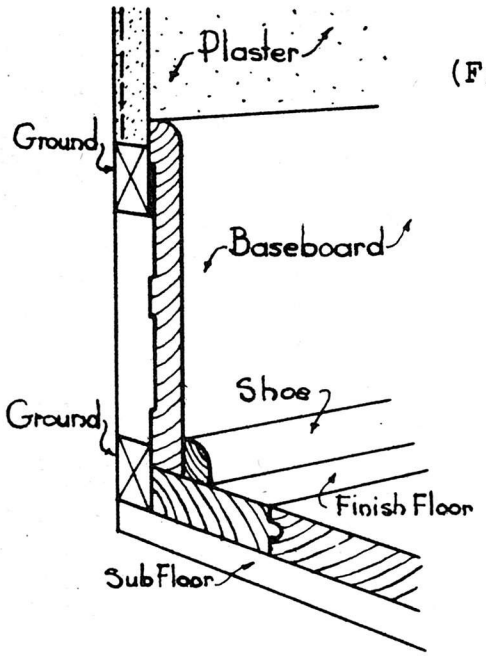


FIG. 1
PLAIN BASEBOARD

A shoe is used on all types of bases (Fig. 1). This member is usually a quarter

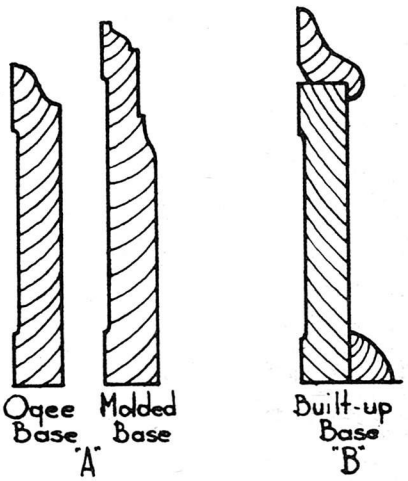


FIG. 2
MOULDED BASEBOARDS

round moulding 25/32 in. x 25/32 in. and is used to cover the joint between the bottom of the baseboard and the top of the floor. The base shoe should be nailed to the base rather than to the floor as it is a part of the base trim. Should any settlement or movement of the walls or floor occur, no opening will show between the baseboard and the shoe. If the shoe is nailed to the floor any settling would bring the shoe down with the floor, thus showing an unfinished surface on the base at the top of the shoe.

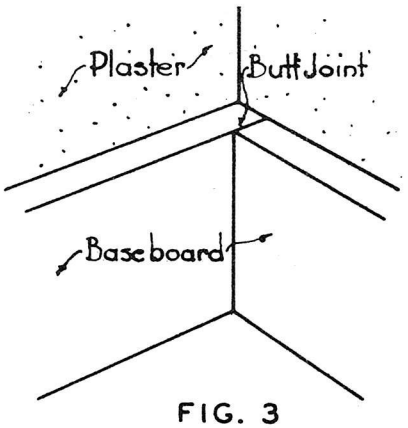


FIG. 3

BUTT JOINT

Besides the plain baseboard shown in Fig. 1, it is possible to obtain baseboards with a moulded top edge (A, Fig. 2). A built-up base consisting of a plain piece with a separate moulding is also commonly used (B,Fig.2). The latter type is often used where a base with a moulded top is desired. It is somewhat simpler to make the corner joints with this built-up baseboard than with the solid board with the moulded top. All styles are obtainable in several widths ranging from approximately 4 in. to 8 in.

INTERSECTING JOINTS OF BASEBOARDS

Figure 3 shows the butt joint which is used most commonly in the plain type of baseboard where the top edges are slightly rounded off. If the base is rounded off to the extent shown in Fig. 1, the joint should be a combination butt and miter joint so as to give a mitered effect. See Fig. 4. Sometimes a joint as shown in Fig. 5 is used at the corners of round edge bases.

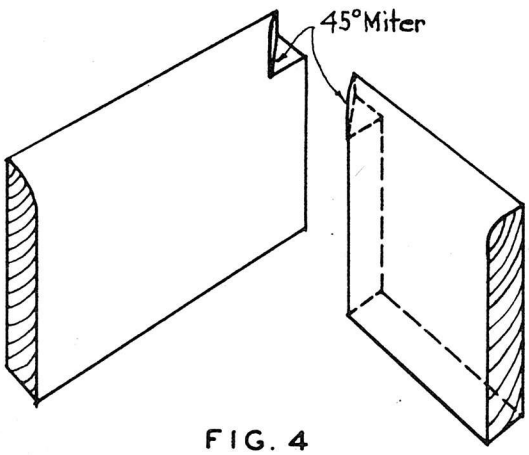


FIG. 4

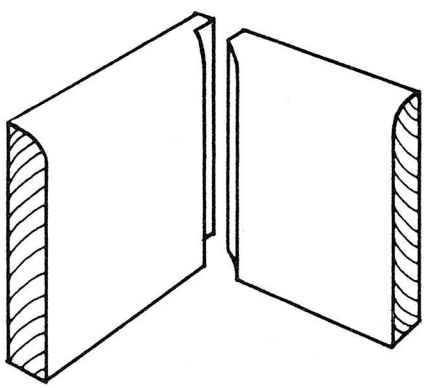
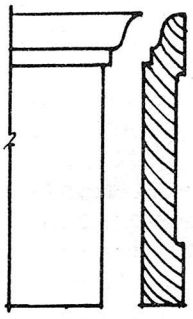


FIG. 5

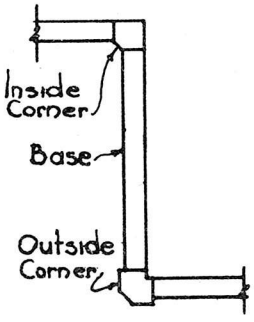
COMBINATION BUTT AND MITER JOINT

Moulded bases are often fitted together at internal corners with a coped joint (Fig. 6). The straight cut is laid out, often by scribing. A miter cut is then made from the top edge down through the moulded section to give the profile of the moulding. This profile is cut out square with the face and the straight cut is then made.



COPED MOULDED BASEBOARD
FIG. 6

Another method of forming internal and external corners is by the use of square blocks to which the base is butted. This method saves installation time and gives a good joint. See Fig. 7. The edges of the blocks project about 3/16 in. beyond the surface of the base and the blocks are chamfered at the corner.



BLOCK AT CORNERS
FIG. 7

External corners are sometimes butted but this type of joint shows end grain and should be used only in rough work. The mitered joint is the most common method of forming external corners.

SELECTED REFERENCES

Wood Construction ..... National Committee on Wood Utilization

Audels Carpenters and Builders Guide #4 ..... Graham and Emery

HOW TO INSTALL BASEBOARDS

OBJECTIVES OF THE UNIT

1. To show how to lay out and cut baseboards.
2. To show how to fasten baseboards in place.
3. To show how to return baseboards at register openings.

INTRODUCTORY INFORMATION

Baseboards are installed after the door jambs and casings are fitted. They may be installed either before or after the finish floor is laid. The bottom edge of the baseboard is kept about 1/4 in. above the location of the top of the finish floor. This space will later be covered up by the base shoe. If no base shoe is to be used, the finish floor is laid before the baseboard which is then scribed to the floor.

TOOLS AND EQUIPMENT

Crosscut saw, 10 pt.	Brace and 3/4 in. bit	Nail set
Hammer	Extension rule	Chalk
Compass saw	Coping saw	Base hook
Combination square	Block plane	Scriber

PROCEDURE

HOW TO CUT AND INSTALL BASEBOARD

NOTE: Figure 1 shows a typical room containing most of the conditions that would be encountered in applying baseboard.

1. Select clear baseboard stock free from twists and imperfections. If it is the moulded type, inspect the moulded edges for imperfections such as chipped edges or poorly machined surfaces.
2. Measure the distance from plaster to plaster along the end of the room marked A. Use an extension rule for this purpose.
3. Transfer this length to a length of baseboard. Mark these points on the top edge of the baseboard and square from these points. Taper the cut at each end so that the length of the base at the bottom edge will be about 1/4 in. shorter than the top edge.
4. Place the baseboard in position, being careful not to injure the plaster or the baseboard. Use a block of wood to tap the baseboard in place. If the finish floor has not been laid, use a block of finish flooring to keep the baseboard the correct distance above the subfloor as shown in Detail H of Fig. 1.

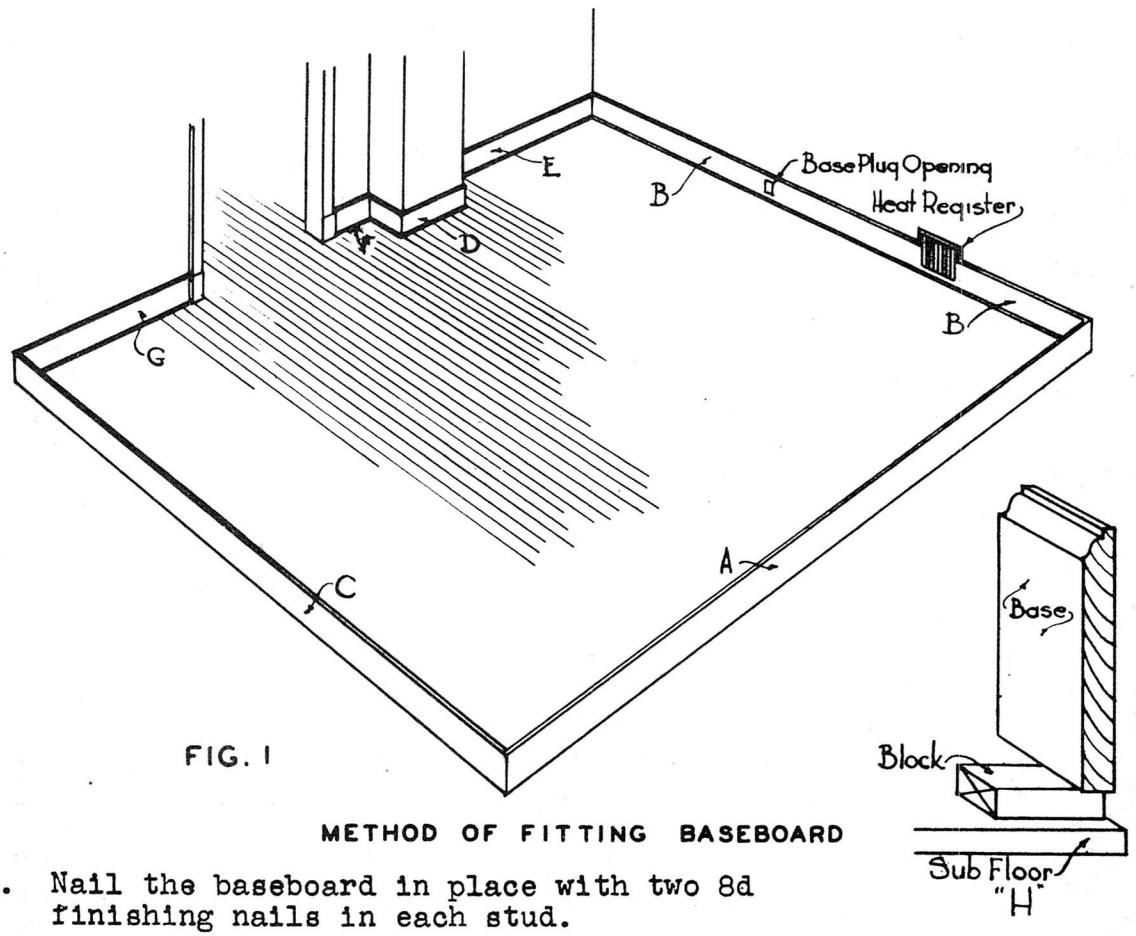


FIG. 1

METHOD OF FITTING BASEBOARD

5. Nail the baseboard in place with two 8d finishing nails in each stud.

6. Measure and cut the baseboard marked B. This measurement should be taken from the face of base A to the opposite wall. Allow enough stock to form a coped joint to fit against base A.

   NOTE: In most cases, this coped joint will have to be scribed to the surface of base A and there should be an additional 1/2 in. allowed for this process.

7. Scribe the straight part of the baseboard B, and from the top end of this line, mark a 45 degree line.

8. Cut this miter and cope the moulded section. See Fig. 6, page 161.

9. Cut the straight section to the scribed line.

10. Nail this piece of baseboard in place.

11. Measure, cut and nail the baseboard around the pilaster (Fig. 1). The measurement is taken from the plastered wall, allowing enough stock for the joint at the outside corner of the pilaster.

    NOTE: The application of the baseboard around the pilaster before the base E is placed is only necessary when the pieces around the pilaster are short and apt to split when nailed. Applying the baseboard around the pilaster before applying baseboard E permits these short pieces to be longer and to be held in place by the baseboard E which would be coped on both ends. If the pilaster is large, piece E needs to be scribed only to piece B. This same principle holds true in fitting piece F.

12. Cut the piece F to the plinth block or casing and scribe it to the surface of the baseboard on the pilaster.

    NOTE: Be careful not to cut these pieces so long that they will force the jamb out of line when the pieces are forced and nailed in place. Set the nails in all the baseboards.

13. Cut and place piece C. Cope the end that fits against piece A and butt the other end against the plaster.

14. Fit piece G in place. One end should be coped to fit against piece C and the other end should be fitted against the door casing or plinth block.

HOW TO CUT A BASE PLUG OPENING IN A BASEBOARD

NOTE: Figure 1 shows a base plug opening in the baseboard. To locate and cut the opening in the baseboard, proceed as follows:

1. Fit the baseboard in its proper place on the wall. Be sure to put the finish floor blocks under the bottom of the base if the finish floor has not been laid.

2. Mark the outer edges of the outlet box with blue chalk. Replace the baseboard in position and tap it lightly against the edges of the plug box. Remove the baseboard and the outline of the box should show on the back.

3. Bore a hole, at each corner of the box outline until the spur of the bit shows through. Remove the bit and complete the hole from the other side.

4. Cut around the chalk lines with a compass saw, allowing about 1/8 in. clearance on all sides. Replace and nail the baseboard.

NOTE: If small registers come within the baseboard, the same procedure would be used as in cutting a base plug opening.

HOW TO FIT A BASEBOARD AROUND A HOT AIR REGISTER

NOTE: Figure 1 shows a hot air register that projects above the top of the baseboard. The baseboard is fitted against and around the top as follows:

1. Cut the baseboard so that it butts against each side of the register. Keep the ends of the baseboard about 1/2 in. from the register metal lining.

2. Rip pieces about 2 in. wide from the top edge of base stock. These pieces should be long enough to be mitered around the top and sides of the register.

3. Butt the two side pieces onto the top edges of the baseboard and miter them to the piece that extends across the top of the register as shown in Fig. 1.

   NOTE: If moulded baseboard is used, the same procedure is followed, except that the two side pieces may be mitered into the moulded base.

4. Cut the base shoe to length and cope the internal corners.

5. Temporarily nail the shoe in place. It may be permanently nailed after the finish floor is laid.

DESCRIPTION OF WALL PANEL AND CEILING TRIM

OBJECTIVES OF THE UNIT

1. To describe wall battens and methods of application.
2. To describe ceiling mouldings and trim.
3. To describe matched board side wall coverings.

INTRODUCTORY INFORMATION

Wood trim such as batten strips, mouldings, matched boards and built-up beams for wall and ceiling decoration are being used extensively since the dry wall type of construction has become popular. Joints in wall boards are effectively covered up by the application of wood trim. Allowance may be made for contraction of the wall surfaces without showing a break at the joints of the wall board. In this unit, only the methods of concealing joints by the application of wood trim will be considered.

DESCRIPTION OF BATTENS

Battens are strips of wood used to cover joints in various types of wall and ceiling coverings. Battens used for wood or for composition wall board are essentially the same. They may be plain flat strips with rounded or chamfered edges (Fig. 1) or they may be moulded strips (Fig. 2). They are obtainable in thicknesses of from 3/8 in. to 3/4 in. and in widths of from 1 in. to 2 1/2 in. Standard back bands, mouldings and casings may also be used for wall and ceiling trim. The same type should be used for both the walls and ceiling to avoid the difficulty of joining two different kinds of trim.

The arrangement and spacing of battens and other trim on wall or ceiling surfaces is a very important factor in the appearance of the finished job. This arrangement depends partly on the size and placement of the individual panels of wall board since all joints must be covered. However, additional battens may be put in spaces where no joints occur to balance the arrangement or to produce desired patterns.

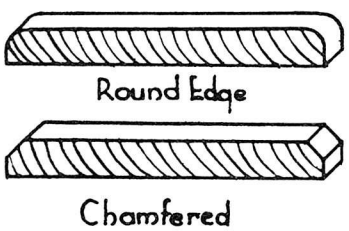


FIG. 1

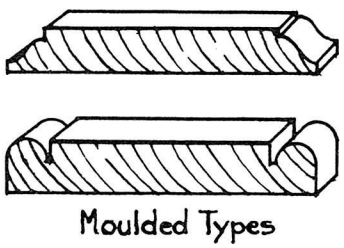
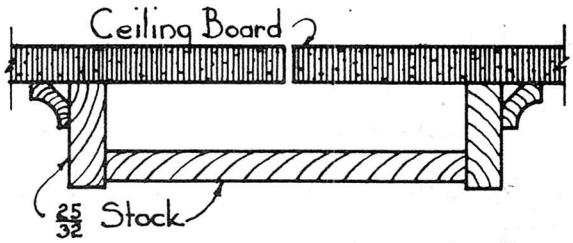


FIG. 2

BATTENS

In some cases, beam ceiling effects are obtained by building beams of regular trim stock and finishing the corners with mouldings (Fig. 3).

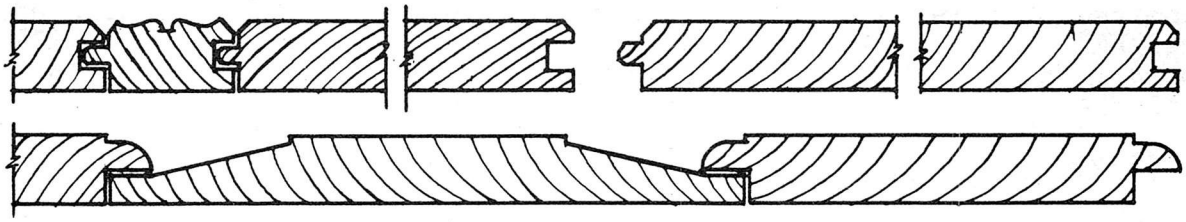


SECTION OF CEILING BEAM

FIG. 3

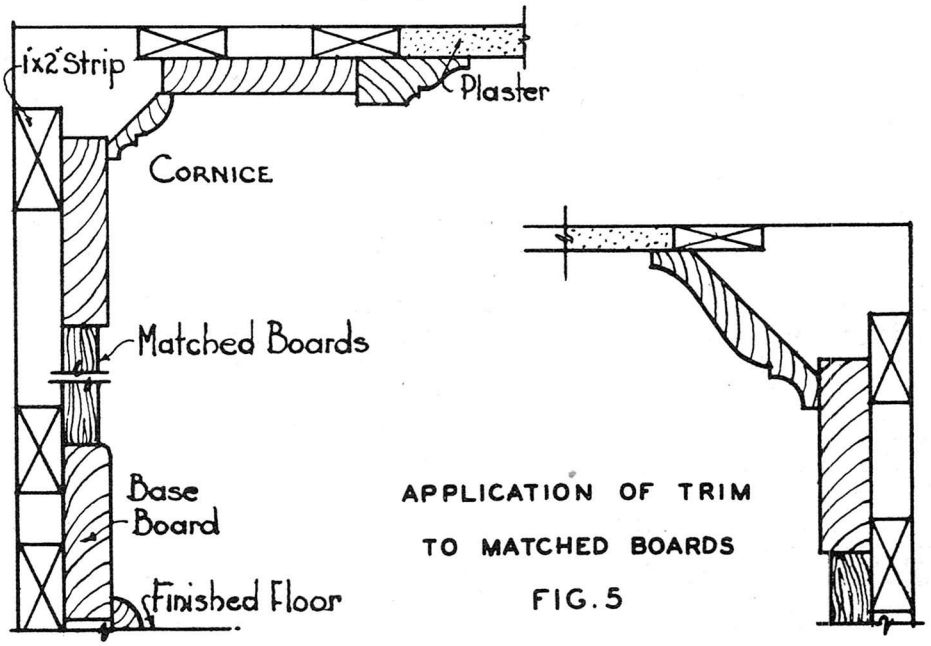
DESCRIPTION OF MATCHED BOARD WALL COVERINGS

Matched boards of many shapes and sizes are used to produce panel effects on interior walls. They are commonly 25/32 in. thick and from 8 in. to 10 in. wide. Figure 4 shows some of the common shapes. These boards are obtainable in several different kinds of wood, the most popular being knotty pine.



MATCHED WALL BOARDS

FIG. 4



APPLICATION OF TRIM TO MATCHED BOARDS

FIG. 5

The material may be applied to the walls either vertically or horizontally and is nailed directly to the studs or furring strips. The baseboards, casings and ceiling trim may be applied over the matched boards or butted to them. Figure 5 shows how matched boards and cornice may be applied to walls. This figure also shows some typical interior cornices and how they are assembled. The intersection of a plastered wall and ceiling could be trimmed by using only the moulding. This trim could be simply a crown, bed or cove moulding.

SELECTED REFERENCES

Plywood Handbook ..... Fisher and Meyer

House Construction Details ..... Burbank

Paneling Old or New Interiors ..... Western Pine Association

HOW TO INSTALL CEILING AND WALL TRIM

OBJECTIVES OF THE UNIT

1. To show how to install ceiling battens and mouldings.
2. To show how to install wall battens, mouldings and matched wall boards.

INTRODUCTORY INFORMATION

Decorative wood battens on walls and ceilings should be applied only after the wall boards have been in place some time. This allows the wall boards to dry out and any defects to show up before the wood trim is placed. The application of the trim differs only slightly from that of casings, stop beads and baseboards.

TOOLS AND EQUIPMENT

Fine crosscut saw
Miter box
Coping saw
Chalk and line
Scriber
Hammer
Block plane
Straight edge
Spirit level
Nail set

PROCEDURE

HOW TO INSTALL CEILING TRIM

NOTE: It is assumed that typical wall boards have been properly applied and that door and window casings and baseboards have been installed.

1. Measure and cut the ceiling battens or moulding to fit into the intersections of the wall and ceiling surfaces.

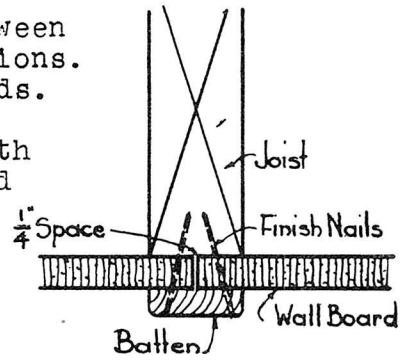
   NOTE: This part of the ceiling and wall trim should be placed first so that the battens over the entire wall and ceiling surfaces may be fitted or scribed to them.

2. Nail the mouldings or battens to both the ceiling joists and the studs or plates of the side walls. Set the nails.
3. Locate the position of the ceiling trim by spacing centers over the surface in such a manner that a symmetrical pattern will be formed.
4. Lay out these distances at opposite ends of the ceiling and snap a chalked line connecting each pair of points.

5. Cut and fit the ceiling trim to length between the trim at the wall and ceiling intersections. Allow enough stock to cope or miter the ends.

6. Nail the trim into the studs or backing with two finishing nails spaced every 14 in. and as shown in Fig. 1.

7 NOTE: If the ceiling trim is wider than the joist, it is assumed that the proper backing has been provided as explained in Unit 1C-P69.



NAILING CEILING TRIM

FIG.1

7. Apply the battens to the corners of the side walls. Mark a plumb line that will locate the edge of the batten.

8. Cut and fit the batten to the top of the baseboard and to the lower edge of the ceiling moulding or batten. Scribe the edge of the batten to the wall surface if necessary.

9. Nail the batten in place, keeping its outer edge on the plumb line.

10. Cut and fit the other member of the corner batten in the same manner. Scribe its edge to the face of the batten placed in step 9 and nail it in place.

11. Apply battens to all the corners of the room in the same manner.

12. Locate and space the wall battens in the same manner as the ceiling strips. Use a straight edge and spirit level to plumb them to a straight and vertical position.

13. Nail them the same as the ceiling battens.

NOTE: The beam ceiling is generally built on the bench in sections. These sections or false beams are then applied to the ceiling in the same way as battens. The mouldings are then applied and fitted.

HOW TO APPLY MATCHED WALL BOARDS

NOTE: It is assumed that the furring or backing strips have been properly applied to the studs and that the matched boards will be placed vertically.

When 25/32 in. stock is used for wall covering, it is generally butted to the trim rather than having the trim overlap the covering.

1. Apply the baseboard and cornice members. See Fig. 5, Unit 1C-T74.

2. Apply the door and window trim as described in Units 1C-P71 and 1C-P72.

3. Fit the ends of the wall boards to the cornice and baseboard members. Use a base hook to mark these pieces. See Fig. 3, Unit 1C-P71.

   NOTE: If the boards are run horizonatally they may be butted to a single 1 1/16 in. x 1 1/16 in. cornerboard at the internal corners of the room.

4. Apply the matched wall boards to the furring or backing strips in the same general manner as sheathing. Do not face nail the boards if it can be avoided. Nail the tongue of the board at each furring strip.

DESCRIPTION OF KITCHEN CABINETS

OBJECTIVES OF THE UNIT

1. To describe the design of kitchen cabinets.
2. To describe the types of kitchen cabinets.
3. To describe the materials used in kitchen cabinets.

INTRODUCTORY INFORMATION

Kitchen cabinets are often planned and built by the carpenter. The doors, drawers and glued sections may be obtained from the mill or may be made at the job.

Complete units and sections may also be obtained from manufacturers ready to install. These cabinets are made to standard dimensions but in enough different sizes to fit almost any kitchen.

DESCRIPTION OF A KITCHEN CABINET

The modern kitchen cabinet is perhaps the most frequently used built-in feature of a house. The planning should be carefully done so the working spaces will be convenient and of the right size, and so the storage space will be adequate. There is a tendency to standardize some of the most important dimensions and consequently the planning has become easier.

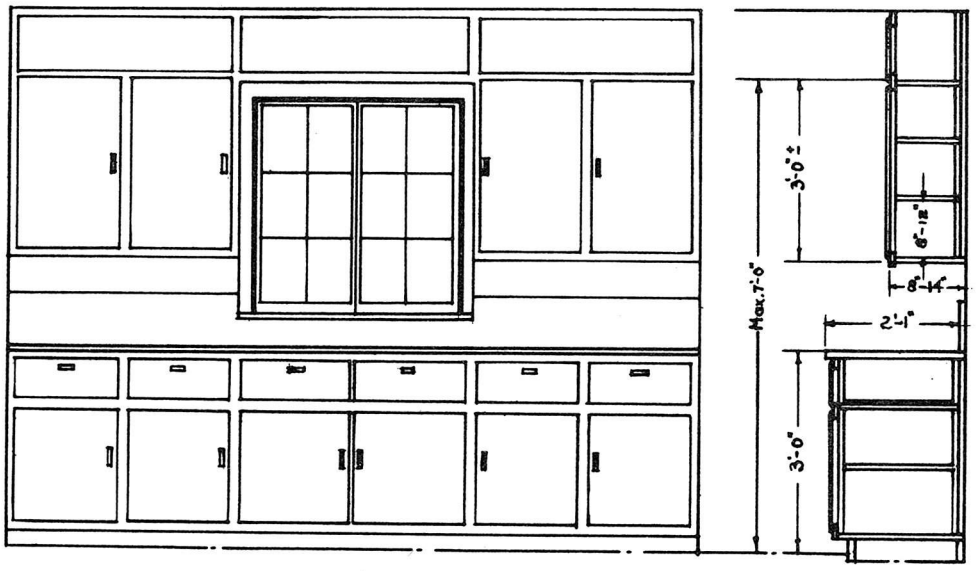


FIG. 1 KITCHEN CABINET

Figure 1 shows the front and end views of a typical kitchen cabinet. The front view shows the arrangement of the drawers and doors. The end view shows the heights and depths.

The counter shelf is generally 36 in. high and 25 in. deep. These dimensions provide adequate working space at the most convenient height for the average person. A counter 36 in. high matches the height of most stoves and also brings a built-in sink to the correct height. Drawers are provided directly under the counter shelf for the more frequently used utensils. There are large cupboards underneath with shelves concealed by doors. At the bottom of the cabinet, a 3 in. x 3 in. recess is made to provide toe room for a person working at the counter shelf.

The wall cabinet is generally a separate unit fastened to the wall. This cabinet varies from 8 to 14 in. deep and from 30 to 36 in. high. It contains shelves from 8 to 12 in. apart for the storage of dishes. Hinged doors arranged to correspond to the doors of the lower cabinet enclose the shelves. In the section view of Fig. 1, this wall case is shown to contain three shelves. The uppermost shelf should be within seven feet of the floor so it will be within convenient reach.

If the ceilings are high, it is necessary to provide a curtain wall to fill the space from the top of the wall cabinet to the ceiling. This wall encloses a space which is sometimes used to house a light over the sink, or electric outlets for a clock or exhaust fan.

The work space between the top of the counter shelf and the bottom of the wall cabinet should be no less than 14 in. This is especially true if the wall cabinet is over 12 in. deep and there is a possibility of striking the head against it while working at the counter shelf.

MATERIALS USED IN KITCHEN CUPBOARDS

The framing materials of the cabinet are generally a good grade of soft pine or white wood suitable for painting. The shelves of the upper and lower cabinets are often plywood or 25/32 in. stock glued together to make a solid shelf. The counter shelf, doors, parts of the drawers and the sides of the cabinets are usually made of plywood. The sides, bottom and back of the drawers may also be made of plywood. The drawer front is made of solid stock. If plywood is used for doors, surface hinges must be used because butt hinges will not hold well on the edges of plywood.

Hardware should not be applied until after the cabinets have been painted. Counter shelf coverings such as linoleum will be omitted in these units as they are not generally applied by the carpenter.

PRE-FABRICATED CABINETS

Many types of pre-fabricated cabinets are obtainable in knocked down or assembled form. They are made in units of standard sizes which may be arranged to fit almost any kitchen layout. It is necessary, however, to decide before the house plans are made whether assembled units are to be obtained from the factory or they are to be built in by the carpenter. Factory built cabinets are superior to those made by the carpenter although they may be more expensive. However, when all factors are considered the additional expense is often justified. Detailed description of these cabinets may be found in the catalogs of manufacturers of these units.

SELECTED REFERENCES

House Planning ..... Field

House Construction Details ..... Burbank

Sweet's Catalog File ..... Dodge Corp.

HOW TO BUILD AND INSTALL A KITCHEN CABINET

OBJECTIVES OF THE UNIT

1. To show how to lay out and build the framework.
2. To show how to install the shelves.
3. To show how to build and install drawers and doors.
4. To show how to install factory built kitchen units.

INTRODUCTORY INFORMATION

Kitchen cabinets are subjected to hard and frequent use. A sink is often built into the counter shelf and the cupboards are used for the storage of food. Becuase of these conditions, the members of the cabinet should be made of lumber that will hold its shape, may be cleaned easily, and will endure constant wear. They should be laid out so that the drawers and cupboards are conveniently located for the efficient preparation of food. They should be assembled with good types of construction at all the joints, drawers and doors.

TOOLS AND EQUIPMENT

Rule	Compass saw	Screw driver
Fine crosscut saw	Hand drill	Saw horses
Rip saw	Jack and block planes	Carpenters bench
Hammer	Clamps	Liquid glue
Square	Scriber	Countersink
Spirit level	Miter box	
Straight edge	1/2 in., 3/4 in. chisel	

PROCEDURE

NOTE: The construction of a typical cabinet such as is shown in Fig. 1, page 172 will be described in this unit. Figure 1 of this unit shows a sectional view of the lower cabinet and the assembly of the various members.

HOW TO BUILD THE BASE CABINET

1. Lay out a complete floor plan of the cabinet on the floor of the kitchen.
2. Lay out the back elevation on the back wall and the end elevations on the end walls.

NOTE: The front stile and rail framework may be laid out from the plan and assembled on the work bench. The stiles

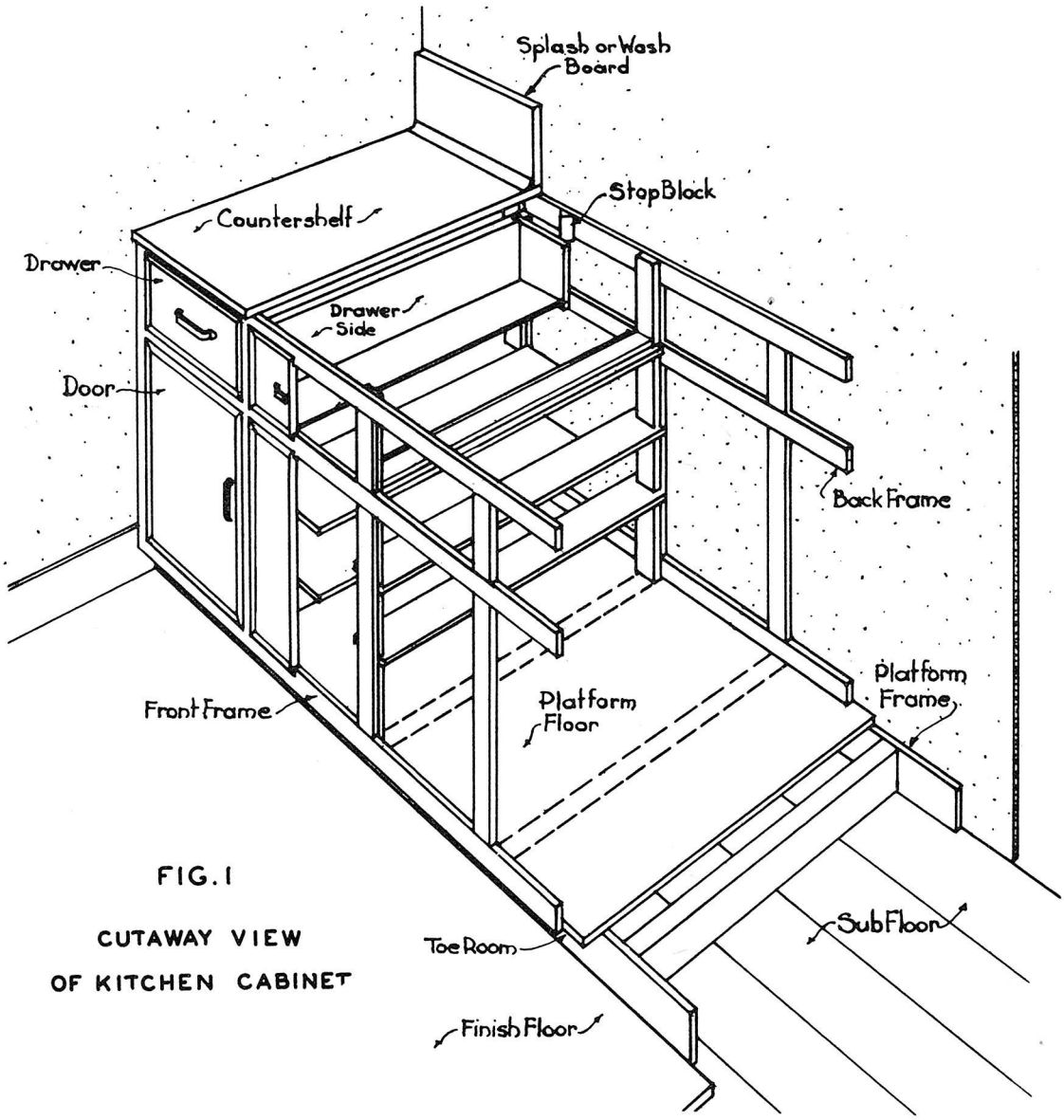


FIG. 1

CUTAWAY VIEW OF KITCHEN CABINET

and rails may be 25/32 in. thick by about 2 3/4 in. wide. This width may have to be altered to accommodate standard size cupboard doors. All connecting joints should be put together with half lap or mortise and tenon joints. They should be glued, clamped and screwed together from the back of the frame. Figure 2 shows this framework.

The full length of these stiles according to Fig. 1, page 172 would be 36 in. minus 1 in. for the counter shelf and 3 in. for the toe space, or 32 in.

3. Lay out the rails AB, CD and EF, Fig. 2, so that they are continuous the full length of the cabinet. Allow 1/4 in. on each end so that the stiles and rails may be scribed to the walls. Locate the joints for the stiles on the rails.

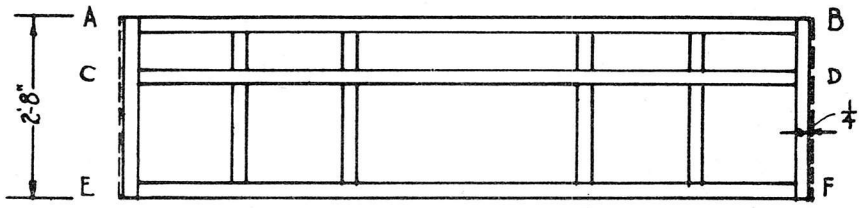


FIG. 2 ASSEMBLY OF FRONT FRAMES

4. Lay out the stiles to length AE and locate the position of the rails AB, CD and EF.

5. Half lap or mortise the joints.

6. Assemble and square the front framework.

7. Make a duplicate frame for the back of the cabinet.

HOW TO BUILD THE BOTTOM PLATFORM

NOTE: The top of the bottom platform is 3 in. above the finished floor. Therefore it will be approximately 4 in. above the subfloor.

1. Lay out and cut seven 2 x 4's to 19 1/2 in. long.

2. Lay out and cut two pieces 25/32 in. x 3 5/8 in. x the length of the front frame minus 1/2 in. Mark the location of the centers of the stiles of the front framework on these pieces.

3. Center the 2 x 4's on these marks and nail the front and back pieces to the ends of these 2 x 4's with 8d finishing nails. Keep all pieces flush with the top of the 2 x 4's. See Fig. 3.

4. Square the frame and place it on the layout on the floor and against the back and end walls.

5. Level it and toenail it to the floor.

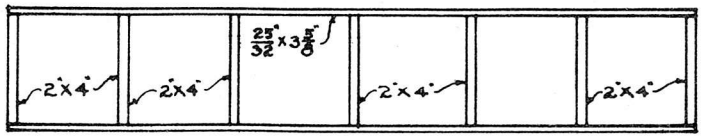


FIG. 3
ASSEMBLY OF PLATFORM

6. Cover the platform with the shelving material. Plywood ½ in. thick is ideal for the purpose. Allow this material to project 2 in. over the front edge of the platform frame.

NOTE: Rip the thickness of the platform floor off of the bottom rail of the back frame so that the tops of the front and back frames will be the same height.

7. Place the back framework on top of the platform and against the wall. Level and plumb it and nail it to the walls.

8. Place the front frame in a similar manner but against the front edge and flush with the bottom side of the platform floor. Plumb and brace it to the back frame. See Fig. 4.

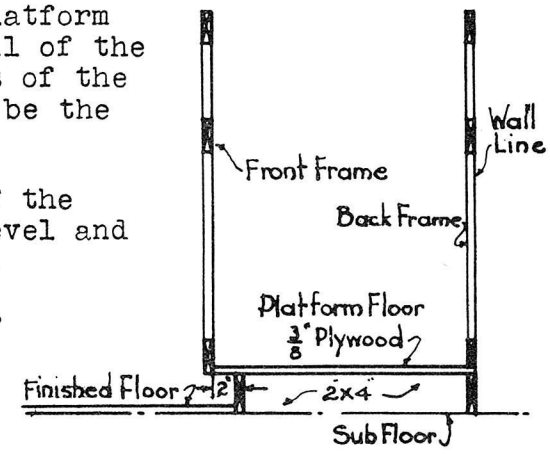
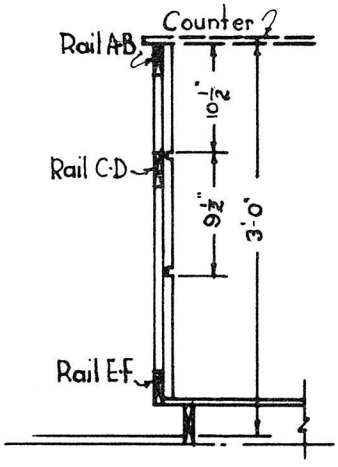


FIG. 4
ASSEMBLY OF FRAMES



LAYOUT OF DRAWER AND SHELF SUPPORTS

FIG. 5

9. Lay out and cut twelve pieces of 25/32 in. stock the same width as the front stiles and long enough to reach from the top of the platform floor to the top of the front framework. In this case, if 1/2 in. plywood is used for the platform floor, the length will be approximately 31 in.

10. Place one piece on top of the platform and against the front framework. On this piece mark the location of the top of the rail CD, Fig. 1 and the bottom of the rail AB. Also make a mark 9½ in. below the top of the rail CD. See Fig. 5.

11. Lay out a 25/32 in. dado 3/8 in. deep at these locations and as shown by the dado joints in Fig. 5. Mark the eleven remaining boards in the same way and cut the dado joints.

12. Square and cut twelve pieces of 25/32 in. stock 2 in. wider than the dadoed pieces and long enough to reach from the front to the back frames. Allow for the dado cuts. The length in this case will be approximately 22 3/4 in.

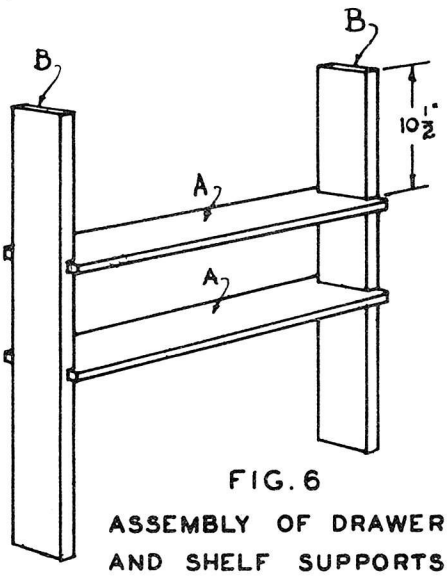


FIG. 6
ASSEMBLY OF DRAWER AND SHELF SUPPORTS

NOTE: Be sure the front and back frames are plumb before getting this length.

13. Assemble four frames as shown in Fig. 6 by gluing and nailing the pieces A,A into the dado joints. Let the pieces project 1 in. on each side of the dadoed pieces.

14. Lay out and assemble two more frames in a similar manner. One frame is for the right hand end of the cabinet and one for the left end. Assemble the drawer and shelf supports such as shown in A, Fig. 6. These should be flush with the upright B on the right hand side of the frame for the right end, and flush with the left hand side of the frame for the left end of the cabinet.

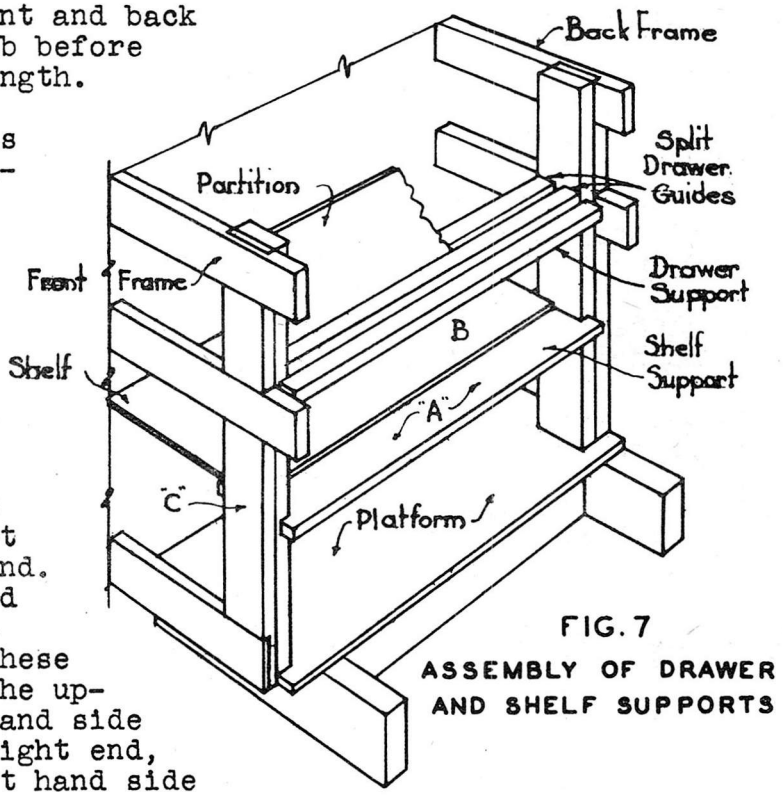
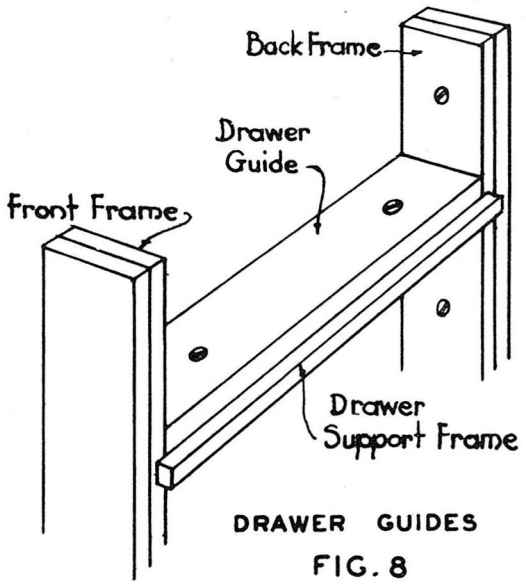


FIG. 7
ASSEMBLY OF DRAWER AND SHELF SUPPORTS



DRAWER GUIDES
FIG. 8

15. Screw the upright supports (B, Fig. 6) in place from the inside and opposite each upright in the front and back frames. See C, Fig. 7.

NOTE: Be sure that the upper surfaces of the drawer slides are square with the face of the front frame and that they are level.

16. Lay out, cut and fit the lower shelf as at B, Fig. 7. Fasten it to the top of the shelf support A.

NOTE: It may be convenient to fit this shelf in the full length of the

cabinet in sections and to screw them in place. This method makes it easier to fit and also to remove the shelf for cleaning. Plywood stock is excellent for shelves.

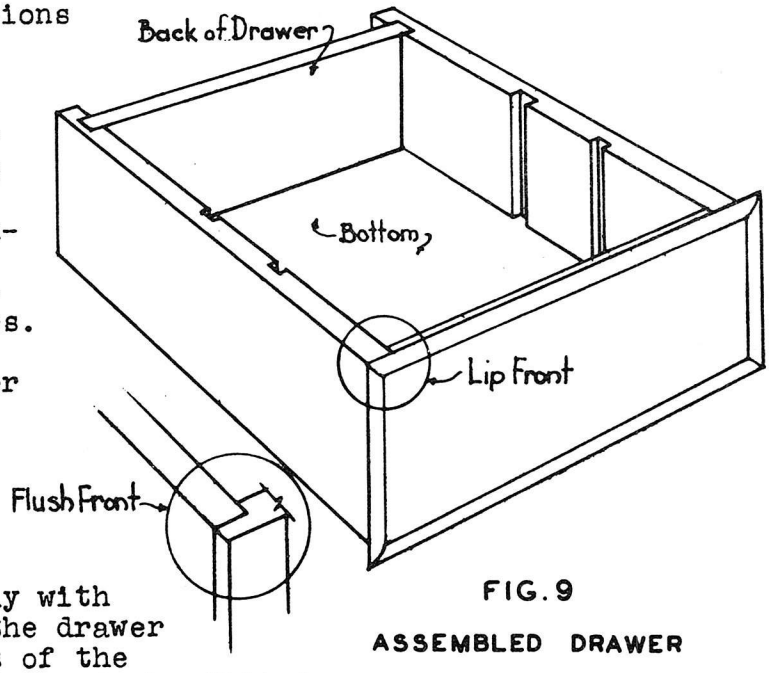


FIG. 9

ASSEMBLED DRAWER

17. Cut the required number of drawer guides from stock 25/32 in. thick and as wide as the frame stiles as shown in Fig. 8.

18. Fasten them temporarily with screws to the top of the drawer supports in both sides of the openings where drawers are to be fitted.

HOW TO CONSTRUCT CABINET DRAWERS

NOTE: Drawers may be constructed so that the front will fit flush with the front of the cabinet or they may be lipped. Figure 9 shows these two types. Assume that the drawer is to be made with a lipped front.

A. HOW TO LAY OUT AND CUT THE DRAWER SIDES

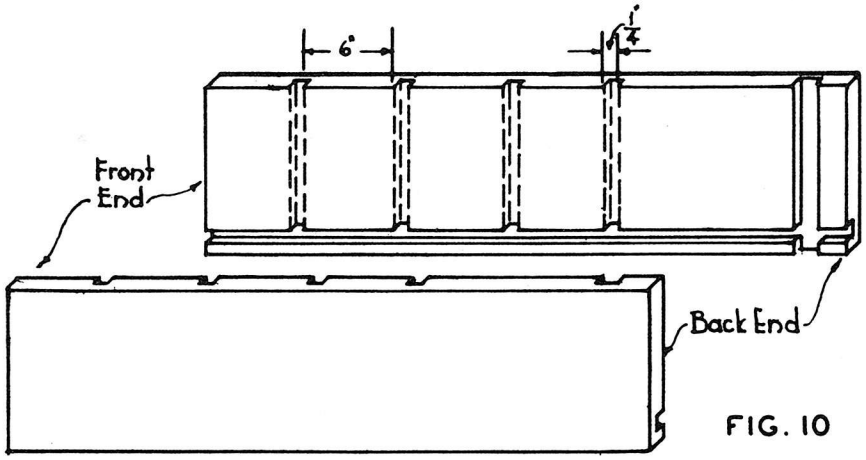


FIG. 10

LAYOUT OF DRAWER SIDES

1. Square up either 25/32 in. solid stock or 5/8 in. 5 ply plywood for the drawer sides. Make these sides 1/8 in. narrower than the height of the drawer opening and 2 in. shorter than the length of this opening.

2. Lay out two drawer sides as shown in Fig. 10. Be sure to make one right side and one left side.

   NOTE: The groove for the bottom should be about 1/4 in. deep and 1 1/16 in. wider than the thickness of the drawer bottom stock. It should be at least 1/2 in. from the edge.

   The dado for the drawer back should also be 1/4 in. deep, as wide as the back is thick and at least 3/4 in. from the back end. Dadoes may also be cut about 6 in. apart on both sides of the drawers, so that partitions may be temporarily placed to form small compartments in the drawers. See the dotted lines in Fig. 10.

3. Cut the dadoes as described in the monograph "Hand Tools and Portable Machinery".

B. HOW TO LAY OUT AND CUT THE DRAWER FRONT, BACK AND BOTTOM

1. Square up the drawer front to the correct size from 25/32 in. or 1 1/16 in. stock.

   NOTE: The height of the drawer front is the same as the height of the sides plus 3/4 in. for the two lips. The length of the drawer front is the same as the width of the opening plus 3/4 in. for the two lips.

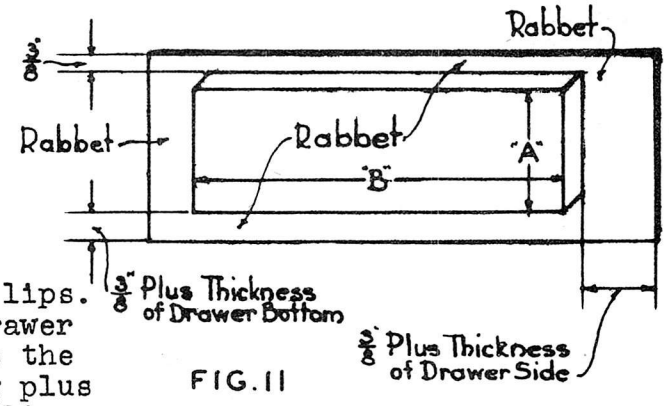


FIG. 11

BACK OF DRAWER FRONT

2. Lay out and cut the rabbets around the four sides of the drawer front as shown in Fig. 11.

   NOTE: The distance A, Fig. 11 should be the same as the distance from the top of the groove in the drawer side to the top edge of this side. Note that the rabbet along the bottom edge of the drawer front is wider than the one along the top edge. The distance B between the two end rabbets of the drawer front should be such that the finished drawer will be 1/8 in. narrower than the opening.

3. Round the four edges of the drawer front as shown in Fig. 9.

   NOTE: If an electric table saw is available, the drawer side may be joined to the front as shown in Fig. 12. This

forms a strong joint but it must be very accurately made.

4. Lay out and cut the drawer back from material the same thickness as the drawer sides.

   NOTE: The height of the drawer back should be the same as the distance A, Fig. 11. The length of the drawer back should be the same as the inside width of the drawer (B, Fig. 11) plus the depth of the dado on each drawer side.

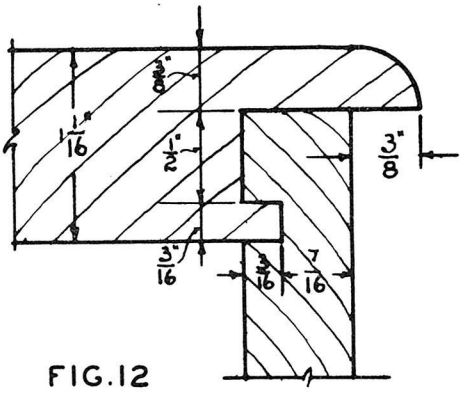


FIG.12

DRAWER LOCK JOINT

5. Lay out and cut the drawer bottom from 1/4 in. plywood. This piece should be the same length as the sides and as wide as the back piece is long.

   NOTE: If the drawer front is to be of the flush type (Fig. 9), it may be squared and fitted to the opening with 1/16 in. allowance on all sides. The rest of the construction would be the same as for the lipped drawer.

C. HOW TO ASSEMBLE THE DRAWER

1. Glue the back into the dadoes in the sides. Keep the top edge of the back flush with the top edge of the sides. Drive 1 1/2 in. brads through the sides part way into the back. See Fig. 9.

2. Glue and nail the sides to the front. Keep the top edges of the sides flush with the top rabbet of the drawer front.

3. Slide the bottom into the side grooves. Do not force it as it may spread the joints.

4. Square the drawer and nail the bottom to the lower edge of the back and to the bottom of the front.

5. Finish driving the nails into the back and front from the sides and sand the rough edges of the drawer. Set the nails.

6. Fit the drawer into the opening and adjust the guides so the drawer will slide easily. Be sure the drawer front lips fit squarely against the front of the cabinet.

   NOTE: Thumb tacks are sometimes inserted in the wearing surfaces of the drawer supports and guides to make the drawer operate more smoothly.

7. Fit and secure blocks at the back of each drawer opening to stop the drawer front lips from striking the front frame too hard when the drawer is being closed.

HOW TO FIT CABINET DOORS

NOTE: If the cabinet doors are to be flush with the cabinet front, they should be fitted as follows:

1. Check the door opening for squareness. If it is square, measure the height of the door opening and transfer this distance to the door. Plane the edges to these lines. Repeat these operations in fitting the width of the door. Allow 1/16 in. clearance on all edges between the door and the door opening.

NOTE: If the lipped type of door is used, the fit is determined by the rabbet cuts in the edges. These are made in the same way as on the lipped drawer fronts.

HOW TO FIT AND APPLY THE COUNTER SHELF

NOTE: If waterproof covering is to be used on the counter shelf, 3/4 in. plywood should be used for the shelf. It might also consist of several boards glued together.

1. Place supporting strips flush with the tops of the front and back frames of the cabinet. Space them about 2 ft. apart.

2. Cut out the material for the counter shelf and fit it to the walls. Allow it to project over the front edge of the cabinet about 3/4 in.

3. Determine the location and size of the sink. Lay out the proper size hole in the counter shelf and cut out the material.

4. Fasten the counter shelf to the supports by using 1/4 in. x 2 1/2 in. flat head bolts. Countersink the heads into the counter shelf. Place two bolts in each support and tighten them from underside of shelf.

NOTE: The counter shelf is generally covered and completed by other mechanics.

HOW TO BUILD THE WALL CABINETS

NOTE: In Figure 1, page 172 the upper wall cabinet is shown on both sides of the window. The section at each side of the window is built separately and then assembled on the wall as a complete unit.

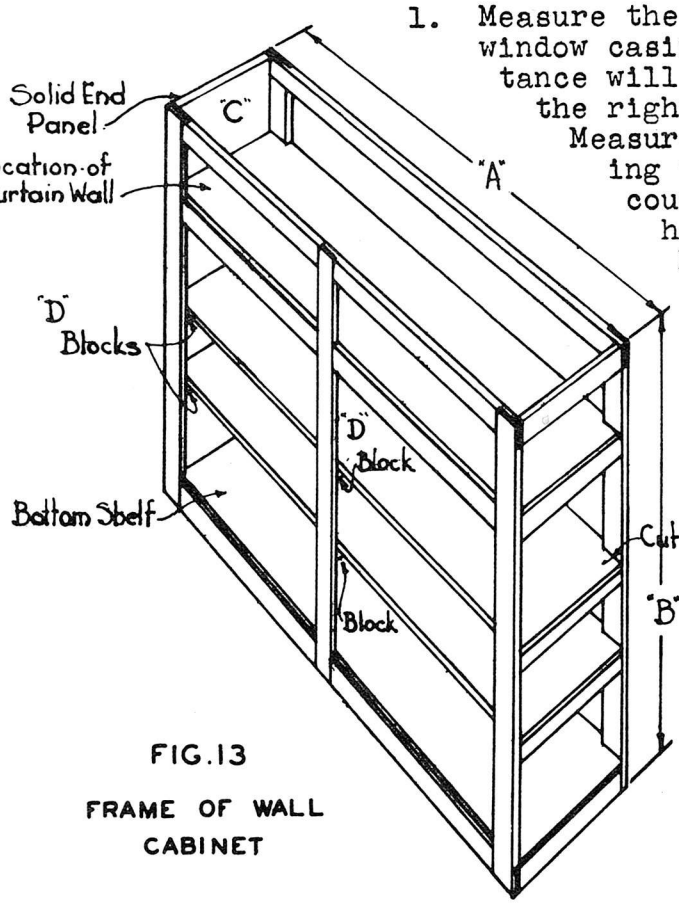


FIG. 13

FRAME OF WALL CABINET

1. Measure the distance from the edge of the window casing to the end wall. This distance will give the outside length of the right hand cabinet (A, Fig. 13). Measure the distance from the ceiling to within 14 or 16 in. of the counter shelf. This gives the height of the cabinet. See B, Fig. 13.

2. Cut the two end back stiles 25/32 in. x 2 3/4 in. and as long as the cabinet is high. Cut the five back rails to length A, minus the thickness of the end wall of the cabinet. Locate these rails in the frame at the proposed shelf locations to support the back edges of the shelves.

3. Half lap the joints and glue and screw them together.

4. Build a front frame in a similar manner but include only three rails and a middle stile as shown in Fig. 13. This front frame should be as long as the outside dimensions of the cabinet.

5. Build the end C of the cabinet of 1/2 in. or 3/4 in. plywood or solid 25/32 in. stock. It should be as wide as the depth of the wall cabinet minus the thickness of the front frame. The length will be the same as B, Fig. 13.

6. Lay out and cut the stock for the four shelves. They should be the same width as the end C of the cabinet and long enough to extend from one end of the cabinet to the other.

7. Notch out the two back corners of each shelf for the two uprights of the back frame.

8. Nail the end C to the end of the back frame as shown in Fig. 13.

9. Nail the front frame to the edge of the end piece.

10. Square and cut five 25/32 in. x 2 3/4 in. braces as long as the distance between the front and back frames.

11. Nail the braces at the right hand end of the back frame opposite each back rail. See Fig. 13.

12. Nail through the front stile into the ends of these braces. Keep the braces square with the faces of the back and front frames.

13. Install the shelves and fasten them to the tops of the rails in the back frame and to the braces at the end of the frames. Screw small blocks under the shelves on the middle and left hand stiles of the front frame to support the shelves at these points. See D. Nail or screw the shelves to these blocks.

14. Hang the frame to the ceiling by nailing strips to the inside of the front top rail of the front frame and into the ceiling joists. The strips should be about 1 5/8 in. x 1 5/8 in. Nail the back frame to studs in the back wall.

15. Layout, build and hang the left hand wall cabinet in the same manner. Connect the cabinets with rails 25/32 in. x 2 3/4 in. See A and B, Fig. 14.

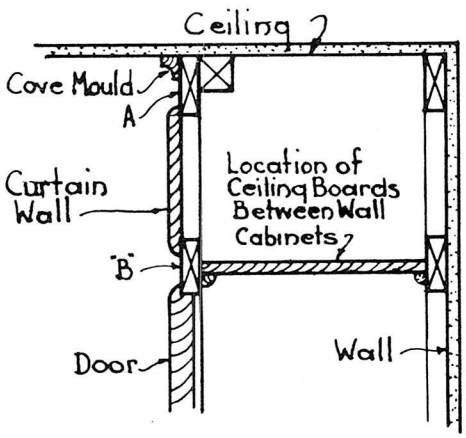
16. Fit the doors in the same manner as those of the lower cabinet.

17. Measure the length and width of the front curtain wall board. See Fig. 1, page 172. This board should be the same thickness as the lip on the doors. Round the edges and nail the board to the faces of the two erected cabinets and rails A and B as shown in Fig. 14.

18. Measure, cut and fit the ceiling board between the top ends of the two wall cabinets above the sink as shown in Fig. 14.

19. Install curtain walls in the upper sections of the two wall cabinets in the same manner.

20. Cut and nail mouldings to the ceiling board and at the front curtain wall as shown in Fig. 14.



TOP OF WALL CABINET

FIG.14

HOW TO INSTALL PRE-FABRICATED CABINETS

1. Mark the locations of the studs in the plastered walls where the cabinets are to be fastened.

2. Inspect the backs of the cabinet units to judge the furring needed or to determine how the manufacturer's directions for installation can be carried out.

3. Temporarily place the cabinet units. Level and plumb them and scribe them to the adjacent wall and floor surfaces.

4. Assemble the complete base units after they have been properly fitted. Shim them if necessary from the floor, furring strips or braces. Nail or screw them permanently in place.

NOTE: Most kitchen units come with full directions and fastening devices necessary to provide a satisfactory job.

Protect finished surfaces with cardboard so that other mechanics will not injure the cabinet.

DESCRIPTION OF CLOTHES AND LINEN CLOSETS

OBJECTIVES OF THE UNIT

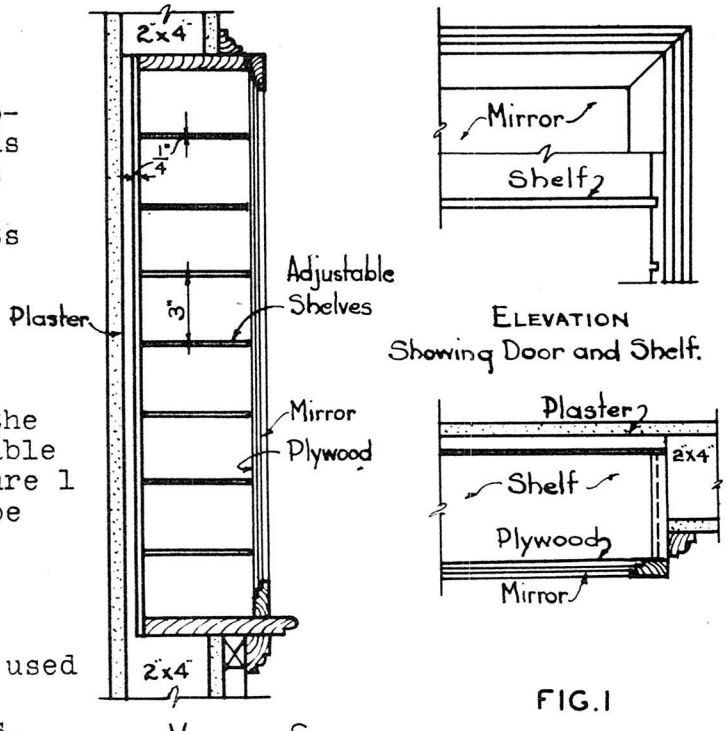
1. To describe the location of closets.
2. To describe the layout of storage closets.
3. To describe conveniences the carpenter may provide in closets.

INTRODUCTORY INFORMATION

The arrangement of space and the built-in features of a closet are important in obtaining the maximum amount of convenient storage space. The sizes of drawers, hangers, cupboards and rods should be determined only after the sizes of the articles to be stored are considered.

BATHROOM MEDICINE CABINETS

These cabinets are made either of wood or enamelled steel, and come ready to install in a variety of sizes. Most factory built cabinets are shallow enough to fit into a bathroom wall framed with 2 x 4 studs. Sometimes a bathroom wall is built of 6 in. studs which would allow a deeper cabinet to be used. Some medicine cabinets will fit between studs spaced 16 in. o. c. Others which are wider than 14 in. require headers and uprights framed into the partition. The cabinet should be placed over the lavatory with the bottom about 4 ft. from the floor. A mirror is placed on the front of the cabinet and several adjustable shelves are provided. Figure 1 shows a cabinet which may be built on the job.



VERTICAL SECTION

ELEVATION
Showing Door and Shelf.

FIG. 1

MEDICINE CABINETS

LINEN CLOSETS

This type of closet is used largely for the storage of blankets, sheets and towels. It may be located in the bathroom, in the hall between

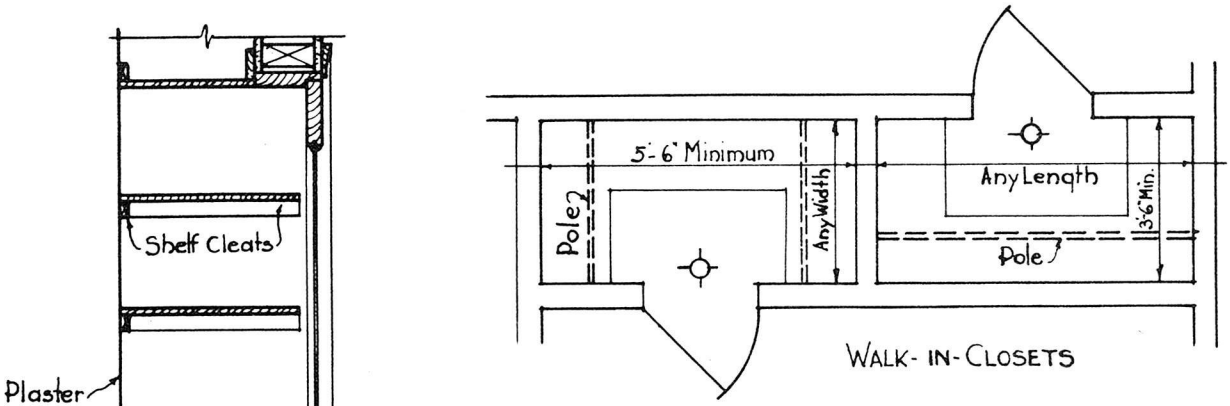
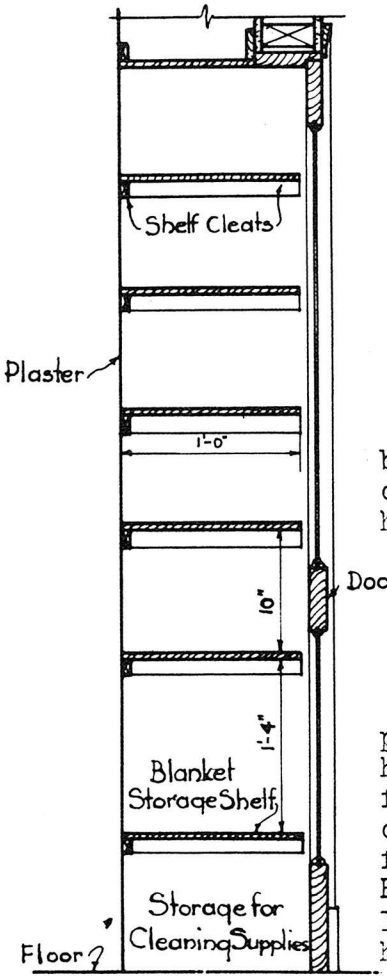


FIG. 3A CLOSET DETAILS

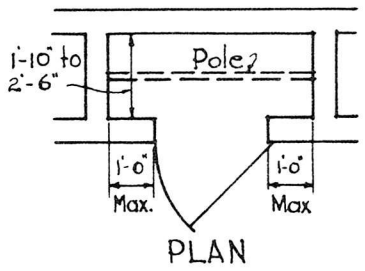
bedrooms, or in a bedroom as a combination clothes closet and linen closet. It usually has drawers in the lower part and shelves in the upper part. If the closet is to be used for storage of woolens which might be damaged by moths, it may be lined with 3/8 in. cedar.

Sometimes, the bottom part of a linen closet has a space for a hamper for soiled clothes or a chute to the basement for the same purpose. Figure 2 shows a typical linen closet for a small home.

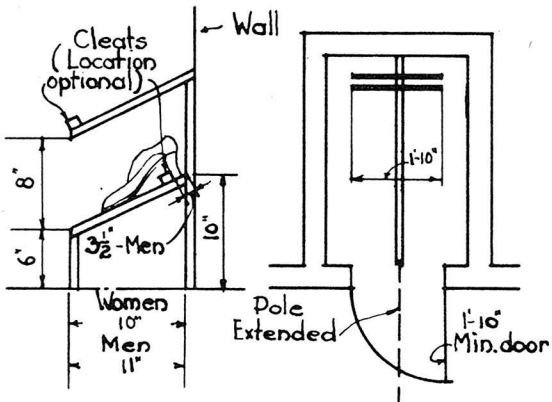


LINEN CLOSET

FIG. 2

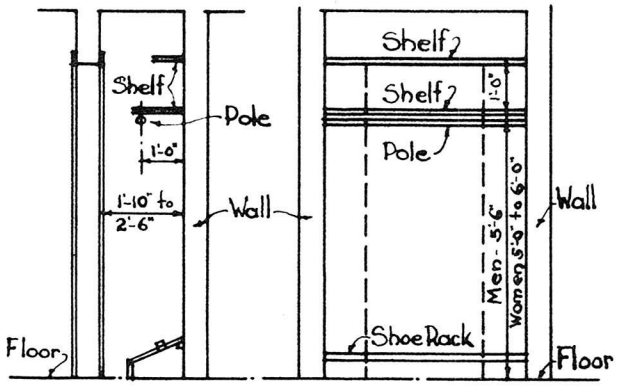


PLAN



DEEP CLOSET NARROW WIDTH

FIG. 3B



SECTION ELEVATION

NARROW CLOSET DETAILS

FIG. 3C

CLOSET DETAILS

CLOTHES CLOSETS

Clothes closets are generally located in bedrooms. They should be provided with the necessary drawers, shelves, hanging rods and hook strips for the storage of wearing apparel. Figures 3A, 3B and 3C show how wall and floor space in a closet might be used.

Figure 4 shows a section of a series of trays and shelves that may be used in a large or small clothes closet or in a linen closet. The dimensions of the trays are such that they are convenient for towels, bed linen and wearing apparel.

SELECTED REFERENCES

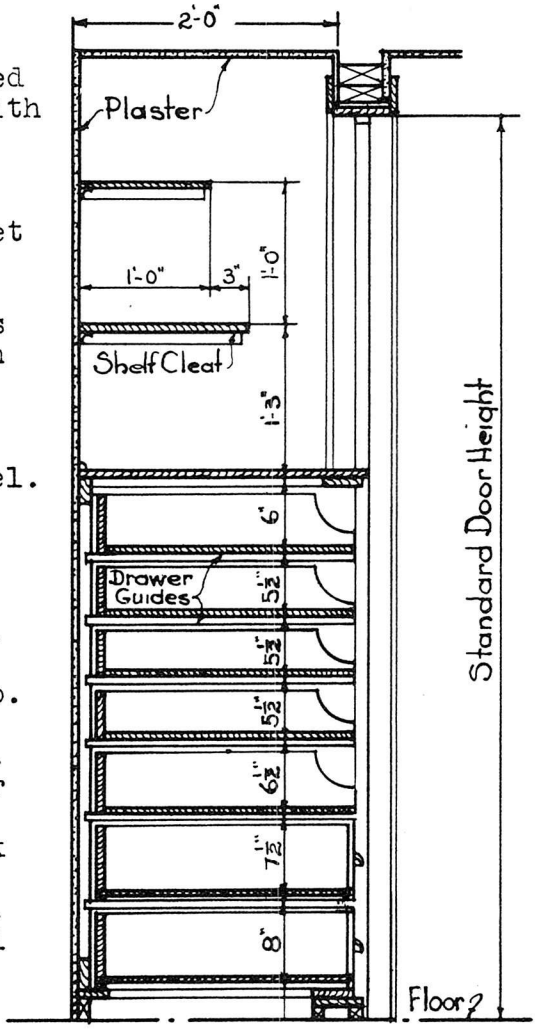
Millwork Catalogs .....

Sweet's Catalog File ..... Dodge Corp.

Architectural Graphic Standards .....
Ramsey and Sleeper

House Construction Details ..... Burbank

How to Plan a House .....
Townsend and Dalzell



SECTION

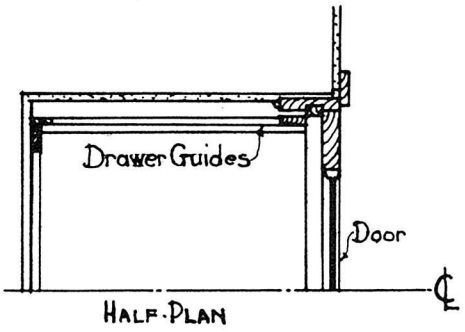


FIG. 3

LINEN CLOSET WITH TRAYS

HOW TO BUILD INTERIORS OF CLOTHES AND LINEN CLOSETS

OBJECTIVES OF THE UNIT

1. To show how to install shelving.
2. To show how to install drawers and cabinet frames.
3. To show how to install clothes hangers.

INTRODUCTORY INFORMATION

The various operations in building cabinets and closets are similar to those described for kitchen cabinets and interior trim. This unit will only describe the processes not previously covered.

TOOLS AND EQUIPMENT

Rule	Hammer	Hand drill
Crosscut saw (fine)	Nail set	Brace, 3/4 in. bit
Rip saw	Compass saw	Scriber
3/4 in. chisel	Spoke shave	Sliding T bevel
Plane	Rabbet plane	Spirit level

PROCEDURE

HOW TO BUILD AND INSTALL A MEDICINE CABINET

NOTE: Medicine cabinets of standard sizes may often be obtained more cheaply from a lumber dealer than the carpenter can build them on the job. However, if special sizes are to be built, the drawing in Fig. 1, Unit 1C-T76 may serve as a guide.

1. Lay out the side jambs and cut the dadoes for the top and bottom.
2. Lay out and cut the shelf dadoes as shown in Fig. 1, Unit 1C-T76.
3. Assemble and square the frame.
4. Apply 1/4 in. plywood for the back of the cabinet.
5. Apply the casings the same as the interior window casings.
6. Set the frame in the opening in the bathroom wall. Level, plumb and nail the cabinet jambs to the sill and uprights of the rough opening. Nail the casings to the wall surface.
7. Fit the door in the same way the kitchen cabinet doors were fitted.

8. Cut shelves to fit into the dadoes.

HOW TO BUILD A LINEN CLOSET

NOTE: Figure 2 of Unit 1C-T76 shows how the shelves are arranged and supported by cleats nailed to the wall.

1. Mark the locations of the shelf cleats on one end wall of the closet. Use a spirit level to get these marks on the opposite end wall at the same height. Nail the shelf cleats to these marks on the walls.

2. Cut, fit and nail the shelves on the cleats.

3. Fit the doors, allowing 3/4 in. clearance between the floor and the bottom of the lower door.

HOW TO INSTALL CLOTHES CLOSET SHELVES AND DRAWERS

NOTE: Fig. 3, Unit 1C-T76 shows how clothes closet equipment may be built. There are no new processes involved.

The drawers shown in Fig. 4, Unit 1C-T76 may be made similar to those of the kitchen cabinet except that the drawer sides are curved at the front edge to meet a narrow drawer front.

DESCRIPTION OF BOOKCASES AND MANTEL SHELVES

OBJECTIVES OF THE UNIT

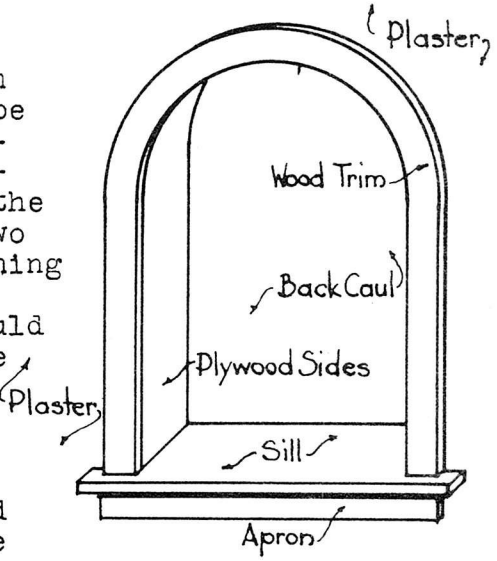
1. To describe a recessed niche.
2. To describe built-in bookcases and corner cabinets.
3. To describe mantel shelves.

INTRODUCTORY INFORMATION

Recessed openings are often made in the wall for small shelves, a telephone or for ornaments. Larger shelves require a framed cabinet permanently built on the wall or around a fireplace.

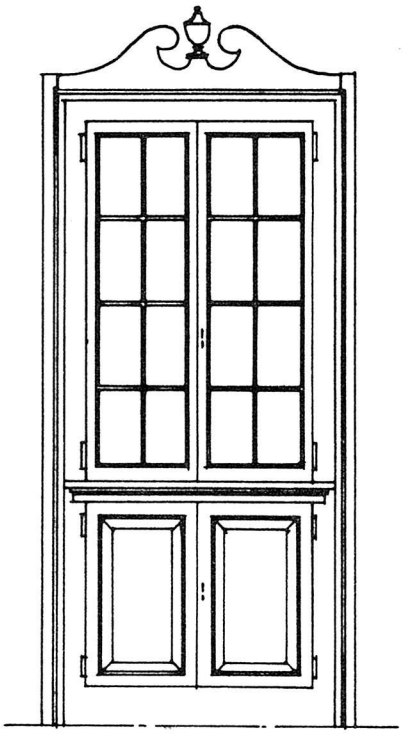
RECESSED NICHES AND SHELVES

Recessed openings should be avoided in outside walls if possible. If they must be put in outside walls, they should be carefully insulated. The width of these openings is generally the distance between two studs. If the opening must be wider, the proper headers should be installed in the framework of the building. A frame similar to that of the medicine cabinet with a plywood back and adjustable shelves is used when the opening is cased. If casings are omitted and the opening is arched, the framework of the opening is made of thin plywood bent to form the arch. Figure 1 shows a typical wall niche.



WALL NICHE

FIG. 1



CORNER CABINET

FIG. 2

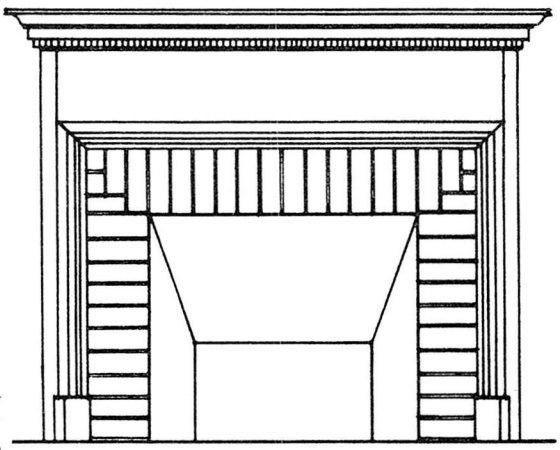
CORNER CABINETS

Corner cabinets are sometimes built into the corners of rooms to hold dishes or ornaments. They may be obtained from a mill in knocked down or in completed form, or they may be framed by the carpenter in the same

general manner as kitchen cabinets. Figure 2 shows one type of corner cabinet. The cabinets may have either an open front or glazed doors.

BUILT IN BOOKCASES

Bookcases are frequently built in the living room. They are often built in conjunction with mantel shelves and around fireplaces. They may have glazed doors but more frequently they are built without doors and have adjustable shelves. The style and layout of bookcases depends on the space available but the general framing and shelf construction is similar to that of kitchen cabinets except that there should be a piece of plywood at the back of the case and the shelves should be adjustable.



FLUSH MANTEL

FIG. 3

MANTEL SHELVES

The fireplace is usually decorated by placing a mantel shelf above the opening. This shelf may be almost any height and size depending upon the shape and size of the chimney.

When the brickwork of the fireplace is built flush with the plaster line, a casing, frieze and cap is built around the brickwork. The cap forms a shelf as shown in Fig. 3.

Mantels and fireplace trim may be built by the carpenter or may be obtained in standard sizes and styles from the mills and assembled on the job.

SELECTED REFERENCES

House Construction Details ..... Burbank

Architectural Graphic Standards ..... Ramsey and Sleeper

Millwork Catalogs .....

HOW TO BUILD A RECESSED NICHE, CORNER CABINET AND MANTEL SHELF

OBJECTIVES OF THE UNIT

1. To show how to build an arched niche.
2. To show how to build a corner cabinet.
3. To show how to build a bookcase.
4. To show how to build a mantel shelf.

INTRODUCTORY INFORMATION

Mantel shelves, bookcases, cabinets and niches are generally made at the mill and delivered to the job ready to be installed or assembled by the carpenter. However, there are times when it is necessary to build them on the job. This unit will give the new processes used in the construction of these units.

TOOLS AND EQUIPMENT

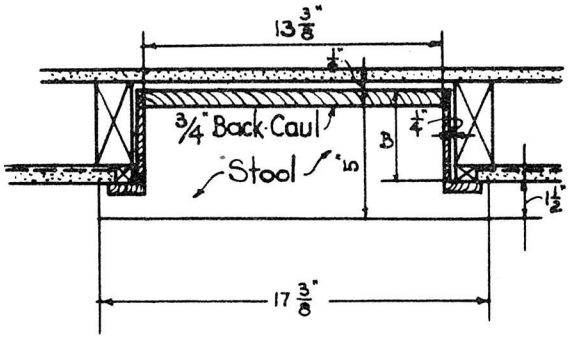
Rule and pencil	Hand drill and drills	Nail set
Combination square	Countersink	Hammer
Crosscut saw, 10 pt.	Jack plane	Brace and bits
Compass saw	Block plane	Scriber
Rip saw		3/4 in. chisel

PROCEDURE

HOW TO BUILD A RECESSED NICHE

NOTE: Assume that a niche similar to that shown in Fig. 1, Unit 1C-T77 is to be built with wood framing and casings.

1. Measure the width, height and depth of the opening in the wall.
2. Lay out and cut 25/32 in. material 1 1/2 in. wider than the depth of the opening and about 4 in. longer than the width of the cabinet opening.
3. Lay out this piece like a window stool as shown in Fig. 1.

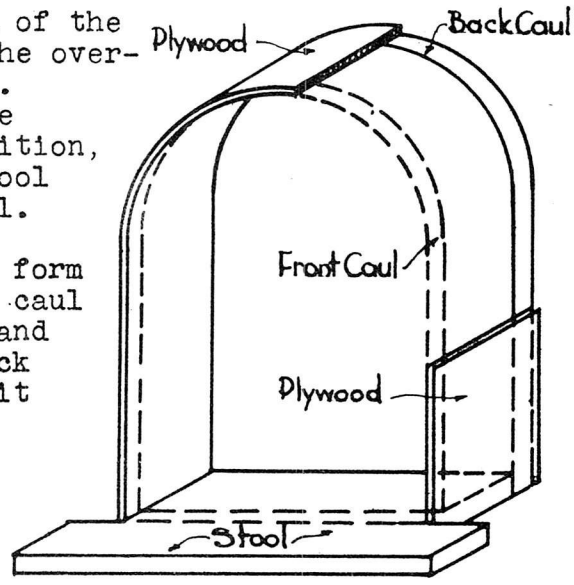


PLAN OF NICHE STOOL
FIG. 1

NOTE: Allow 3/4 in. for the back of the niche, and 1 1/2 in. for the overhang over the plaster line. Assuming the niche is to be placed in a 3 5/8 in. partition, the measurements of the stool would be as shown in Fig. 1.

4. Cut two cauls of 3/4 in. stock to form the arched jamb piece. The front caul should be as high as the opening and 13 3/8 in. wide (Fig. 2). The back caul should be 3/4 in. higher so it can be nailed against the back of the stool.

5. Temporarily nail the front caul to the stool as shown by the dotted lines in Fig. 2. Nail the back caul flush with the bottom of the back edge of the stool.



FRAMEWORK OF NICHE

FIG. 2

6. Measure with a flexible rule the length of the plywood that will make up the sides and arch of the niche.

7. Cut a piece of thin plywood to this length and to the width B in Fig. 1.

8. Nail one end of the plywood to one end of the stool and bend it around the cauls. Nail it to the other end with 1 1/4 in. flat head nails.

9. Nail the back edge of the plywood to the back caul and remove the front caul.

10. Lay out and cut a casing from 1/2 in. or 25/32 in. stock about 2 1/4 in. wide.

NOTE: Use a radius 1/4 in. less than when laying out the cauls. This will allow the casing to overlap the edge of the plywood at the front of the niche.

11. Fit and nail the casing to the stool, arched jamb and plastered wall.

12. Fit, nail and return a small moulding underneath the stool.

HOW TO BUILD A CORNER CABINET

NOTE: Figure 3 shows a typical corner cabinet.

1. Lay out on the subfloor an exact floor plan of the cabinet showing the outline of the stiles, door opening and shelves.

2. Make the front frame to these dimensions and heights (Fig. 3).

3. Lay out and cut the shelves to the size shown on the floor plan.

4. Lay out and cut the back boards of the cabinet. The lengths, widths and bevel cuts may be found by temporarily nailing the top, middle and bottom shelves to the front frame and fitting the back board around the back contour of the shelves as shown in Fig. 3. The back may be 25/32 in. stock or 1/2 in. plywood.

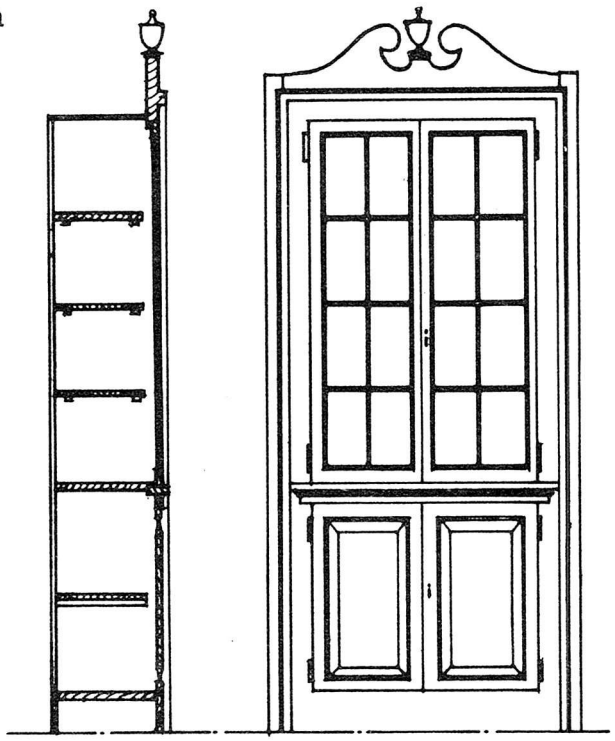


FIG. 3

CORNER CABINET

5. Square the assembled frame, shelves and back boards.

   NOTE: If these shelves are to be adjustable, metal shelf support strips such as shown in Fig. 4A may be used or strips of wood 3/8 in. x 1 in. may be cut out to hold the wooden shelf supports. See Fig. 4B.

6. Cut out and place the required shelf supports on the back boards.

7. Notch the adjustable shelves around the supports so they may be easily removed.

8. Fit and nail the side casings of the front frame to the wall surface.

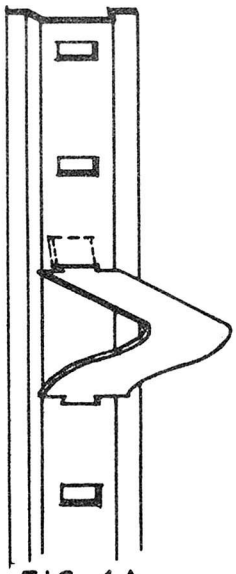


FIG. 4A

METAL SHELF SUPPORT

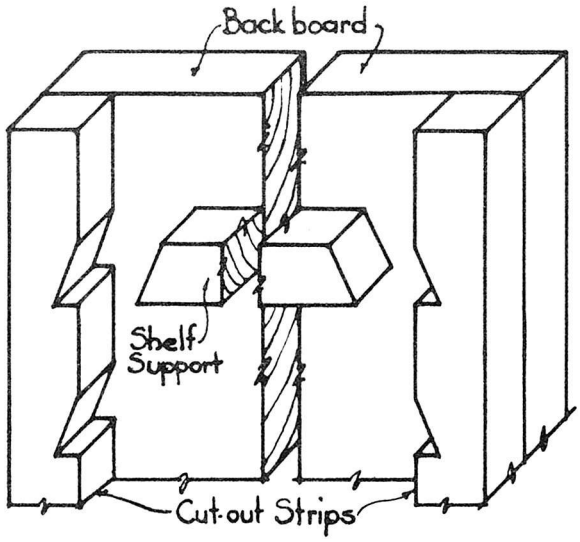


FIG. 4B

WOODEN SHELF SUPPORT

9. Lay out and cut the ornamental head casing from 25/32 in. by 8 in. stock similar in design to the one shown in Fig. 3. Nail it in place.

10. Fit the glazed and paneled doors by the same method used in fitting kitchen cabinet doors.

HOW TO BUILD A MANTEL SHELF ON A FLUSH CHIMNEY

NOTE: Assume that the brickwork is flush with the face of the plaster and that the mantel shelf is supported by pilasters as shown in Fig. 5.

1. Lay out the length and width of the pilasters and frieze according to the size of the chimney. Cut them accordingly.

2. Lay out and build the shelf according to the width of the chimney and similar to that shown in Fig. 5.

3. Assemble the frieze and pilasters by nailing them in a plumb position on the plastered wall and overlapping the sides of the chimney about 1 in.

4. Place wooden plugs in the masonry joints so that the mantel shelf may be securely attached to the masonry surface.

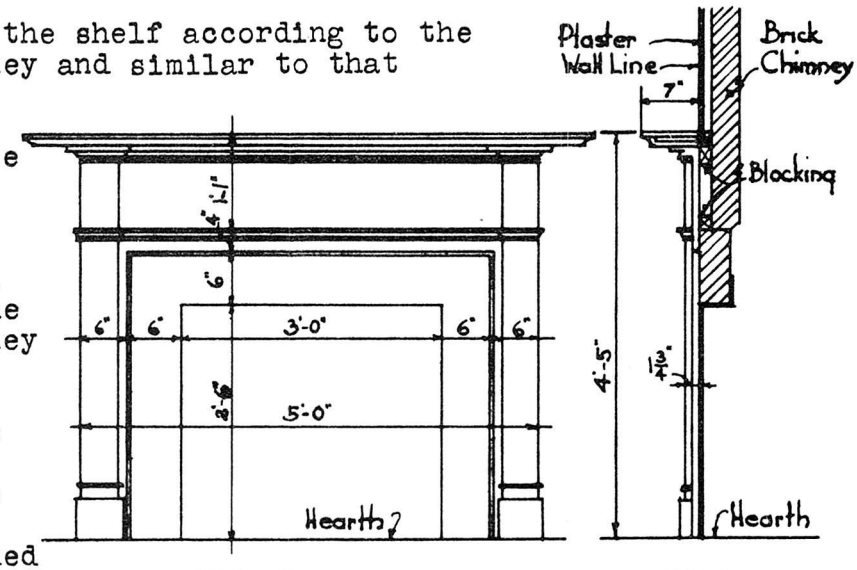


FIG. 5 FLUSH MANTEL SHELF

5. Place the assembled mantel shelf on top of the pilasters across the face of the chimney. Nail it in a level position to the wooden plugs in the joints of the masonry.

   NOTE: It is sometimes necessary to scribe the shelf to the wall surface. A small moulding may be used to cover an unscribed joint.

   The surfaces of the pilasters and frieze may be decorated by fluting, by forming miniature columns and bases, or by mitering mouldings in various designs.

6. Finish the pilaster and frieze surfaces similar to the one shown in Fig. 5. Set all nails and sand the surfaces.

HOW TO BUILD A MANTEL SHELF ON A PROJECTING CHIMNEY

NOTE: When the chimney projects into the room, the recesses at the sides of the chimney are often used for bookcases and the bookcase top is a continuation of the mantel shelf. The bookcase may also set back in a recess with the top level with the mantel shelf as shown in Fig. 6.

1. Build and install the pilasters and mantel shelf as in Fig. 5.

2. Lay out and build the front and back framework according to the dimensions of the space and the height of the doors in Fig. 6.

   NOTE: The framework of the bookcase is made in the same general way as the lower part of the kitchen cabinet.

3. Fit and support the lower shelves in the same manner as the lower shelves of the kitchen cabinet.

   NOTE: Sliding doors are often used in this type of cabinet. In this case, runways should be built at the top and bottom of the door opening in the same general manner as in the sliding window sash. If the doors are to be hinged, they are fitted the same as kitchen cabinet doors.

4. Fit the top and bottom shelves of the upper section in much the same manner as the kitchen cabinet shelves. The partition shown in Fig. 6 is dadoed to these two shelves.

   NOTE: If the shelves are to continue above the mantel shelf and no doors are to be used, a framework or solid end pieces to which shelf supports can be attached may be provided at each end of the recess. Shelves should be installed about 9 in. apart for book storage. If this bookcase is to be built, continue as follows:

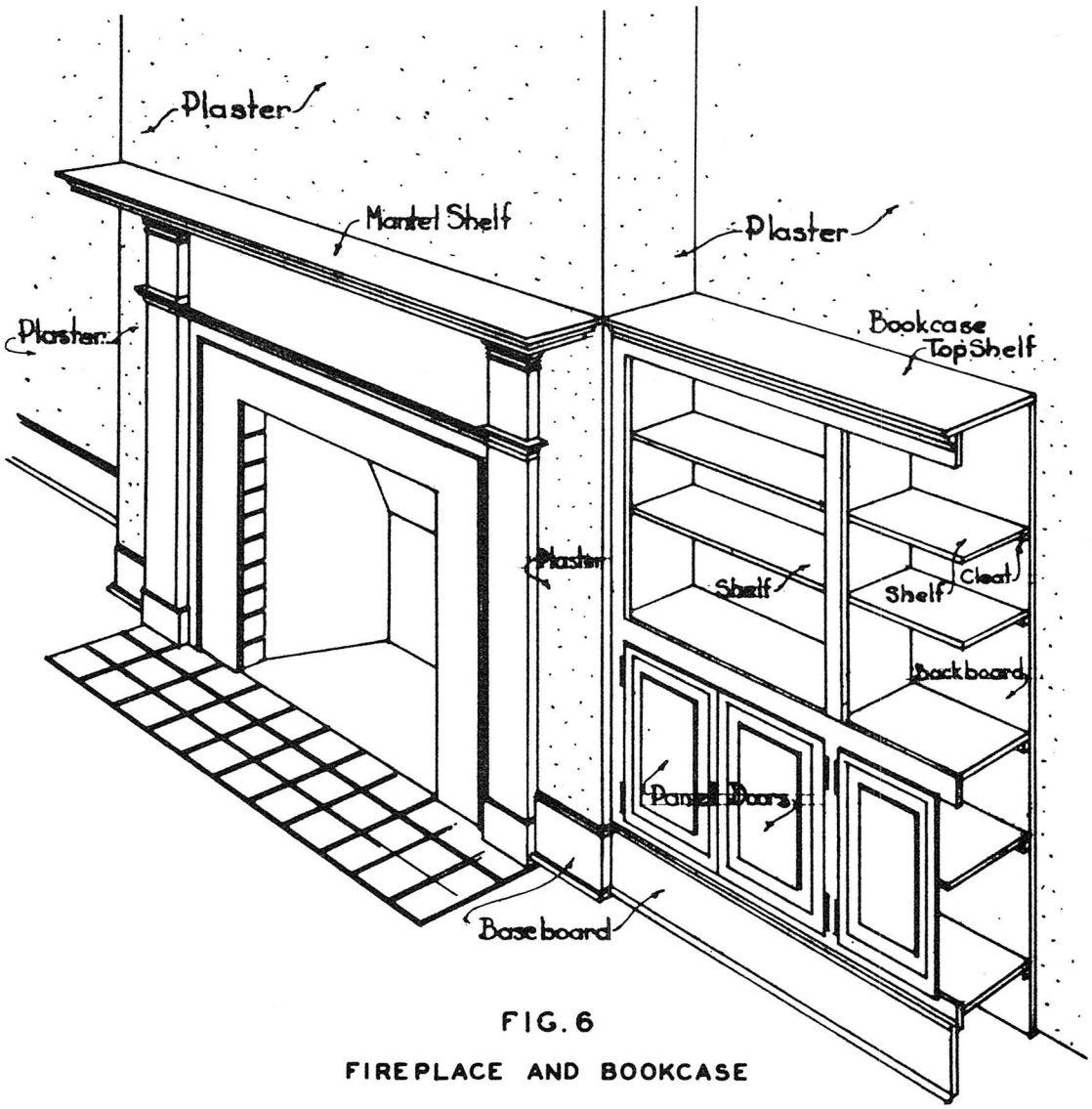


FIG. 6

FIREPLACE AND BOOKCASE

5. Lay out, cut and fit the end wall shelf frames and shelf supports in accordance with the height from the top of the shelf to the ceiling. They should be about 6 in. wide.

6. Arrange for adjustable shelves by using method A or B, Fig. 4.

7. Cut, fit and finish the shelves.

8. Extend the baseboard, shoe and ceiling moulding across the front of the finished bookcase to the fireplace.

9. Set all nails and sand all surfaces and corners.

DESCRIPTION OF FINISH STAIRS BUILT ON CARRIAGES

OBJECTIVES OF THE UNIT

1. To describe the methods of fitting the wall stringers.
2. To describe the methods of fitting the risers.
3. To describe the methods of fitting the treads.
4. To describe characteristics of this type of stairs.

INTRODUCTORY INFORMATION

Units 1C-T55 and 1C-P55 of the monograph "Framing, Sheathing and Insulation" describe the layout of common types of stairs and the construction of stair carriages and bridgework. This unit describes only the application of trim such as stringers, risers and treads.

BUILT-UP STAIR STRINGERS

Since a detailed description of stairs and stair carriages was given in Units 1C-T55 and 1C-P55, no full length stairs will be shown in this unit. Short stairs of three risers will be used. It is assumed that the carriages have been properly placed in the bridgework.

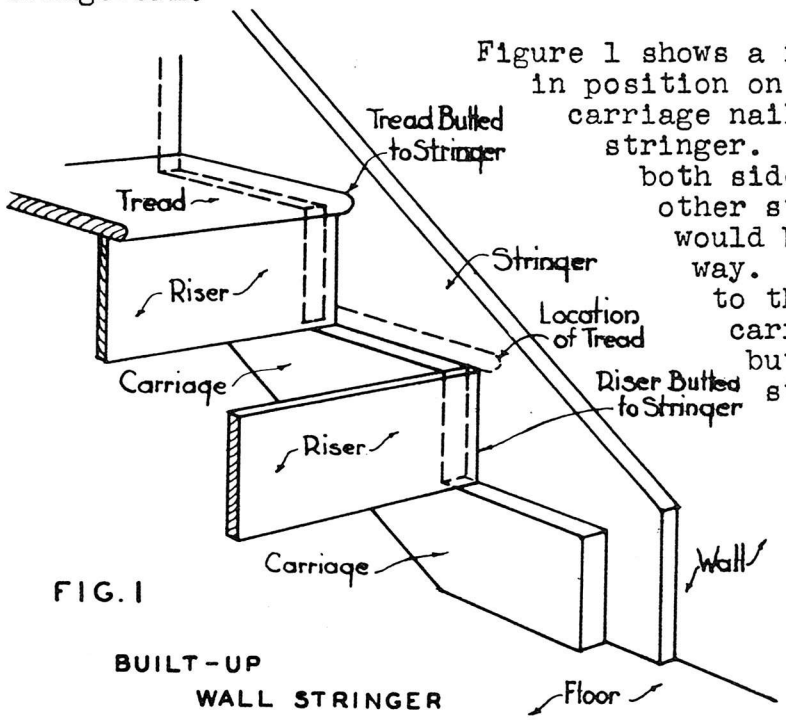


FIG. 1

BUILT-UP WALL STRINGER

Figure 1 shows a finish stringer nailed in position on the wall and the rough carriage nailed in place against the stringer. If there are walls on both sides of the staircase, the other stringer and carriage would be located in the same way. The risers are nailed to the riser cuts of the carriage on each side and butt against each side stringer. The treads are nailed to the tread cuts of the carriage and also butt against the stringers. See Fig. 1. This type of construction is used where the rough carriages were fitted temporarily at the time the stair bridgework was framed.

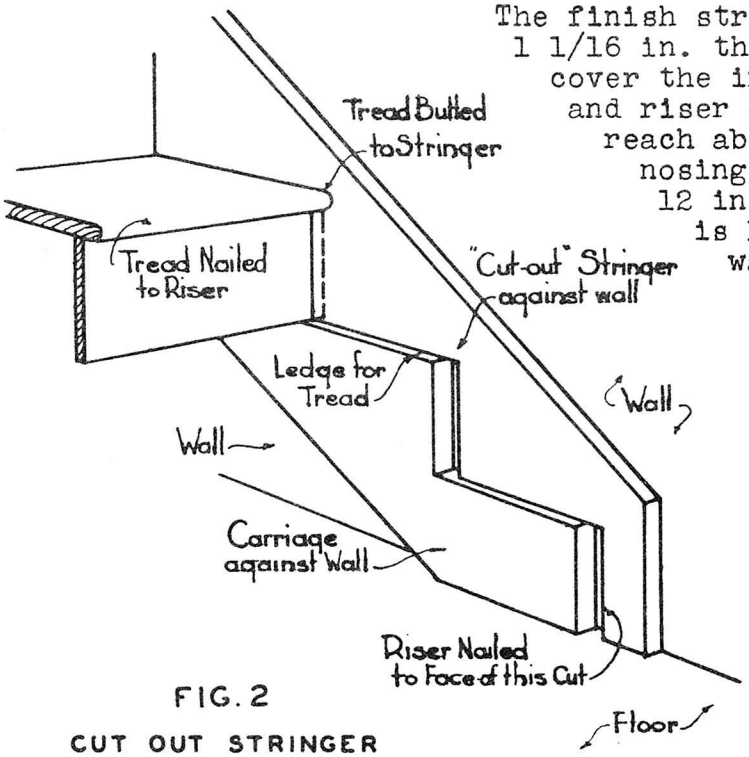


FIG. 2
CUT OUT STRINGER

The finish stringer may be 25/32 in. or 1 1/16 in. thick and wide enough to cover the intersection of the tread and riser cut in the carriage and to reach about 2 in. beyond the tread nosing. This width is usually 12 in. to 14 in. This stringer is laid out in about the same way as a rough carriage but unlike the carriage, it is not cut out at the riser and tread marks. Only the level cut for the floor, the plumb cut for the header, and the plumb cuts at the top and bottom of the stringer for the baseboards are made.

This is perhaps the best type of construction to use when the treads and risers are to be nailed to the carriages. This method saves time and labor in installing stairs but it is difficult to prevent squeaks when the stairs are stepped on. Another disadvantage is that any shrinkage of the frame of the building causes the joints to open up and to present and unsightly appearance.

CUT-OUT STAIR STRINGERS

Another method of fitting the treads and risers to wall stringers is shown in Fig. 2. The stringers are laid out with the same rise and run as the stair carriages, but they are cut out in reverse as shown in Fig. 2. The risers are butted and nailed to the riser cuts of the wall stringers and

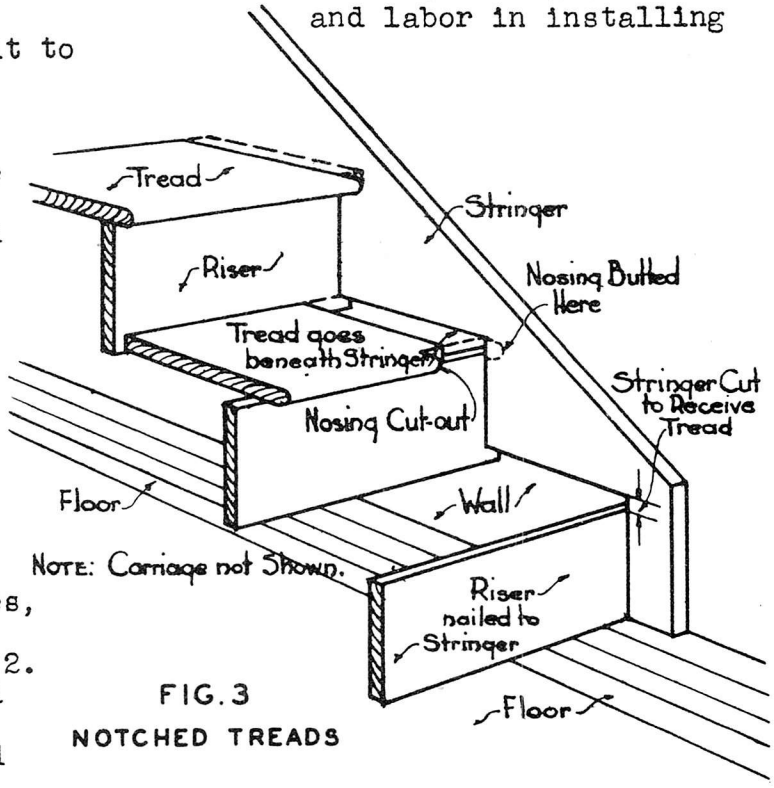


FIG. 3
NOTCHED TREADS

2. Inspect the backs of the cabinet units to judge the furring needed or to determine how the manufacturer's directions for installation can be carried out.

3. Temporarily place the cabinet units. Level and plumb them and scribe them to the adjacent wall and floor surfaces.

4. Assemble the complete base units after they have been properly fitted. Shim them if necessary from the floor, furring strips or braces. Nail or screw them permanently in place.

NOTE: Most kitchen units come with full directions and fastening devices necessary to provide a satisfactory job.

Protect finished surfaces with cardboard so that other mechanics will not injure the cabinet.

DESCRIPTION OF CLOTHES AND LINEN CLOSETS

OBJECTIVES OF THE UNIT

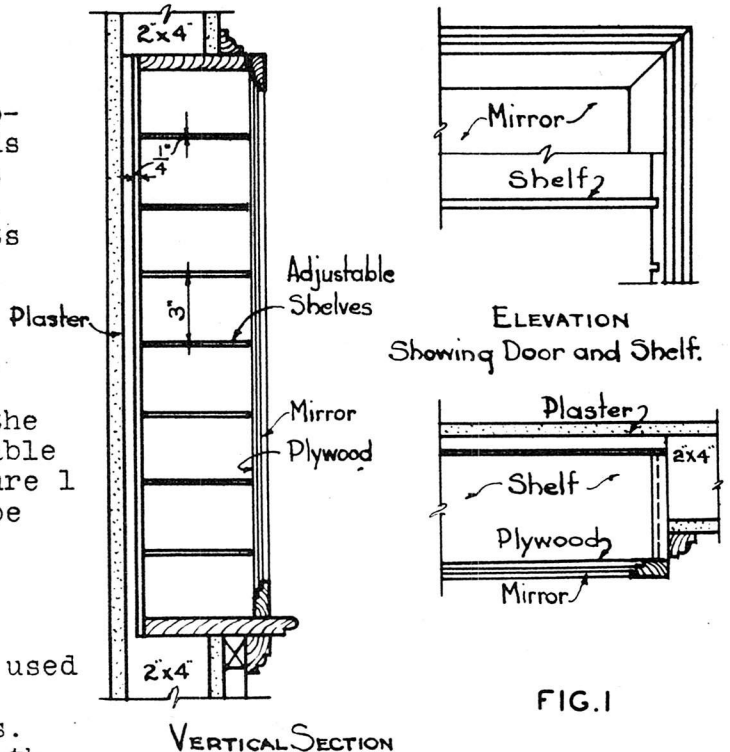
1. To describe the location of closets.
2. To describe the layout of storage closets.
3. To describe conveniences the carpenter may provide in closets.

INTRODUCTORY INFORMATION

The arrangement of space and the built-in features of a closet are important in obtaining the maximum amount of convenient storage space. The sizes of drawers, hangers, cupboards and rods should be determined only after the sizes of the articles to be stored are considered.

BATHROOM MEDICINE CABINETS

These cabinets are made either of wood or enamelled steel, and come ready to install in a variety of sizes. Most factory built cabinets are shallow enough to fit into a bathroom wall framed with 2 x 4 studs. Sometimes a bathroom wall is built of 6 in. studs which would allow a deeper cabinet to be used. Some medicine cabinets will fit between studs spaced 16 in. o. c. Others which are wider than 14 in. require headers and uprights framed into the partition. The cabinet should be placed over the lavatory with the bottom about 4 ft. from the floor. A mirror is placed on the front of the cabinet and several adjustable shelves are provided. Figure 1 shows a cabinet which may be built on the job.



VERTICAL SECTION

ELEVATION
Showing Door and Shelf.

FIG. 1

MEDICINE CABINETS

LINEN CLOSETS

This type of closet is used largely for the storage of blankets, sheets and towels. It may be located in the bathroom, in the hall between

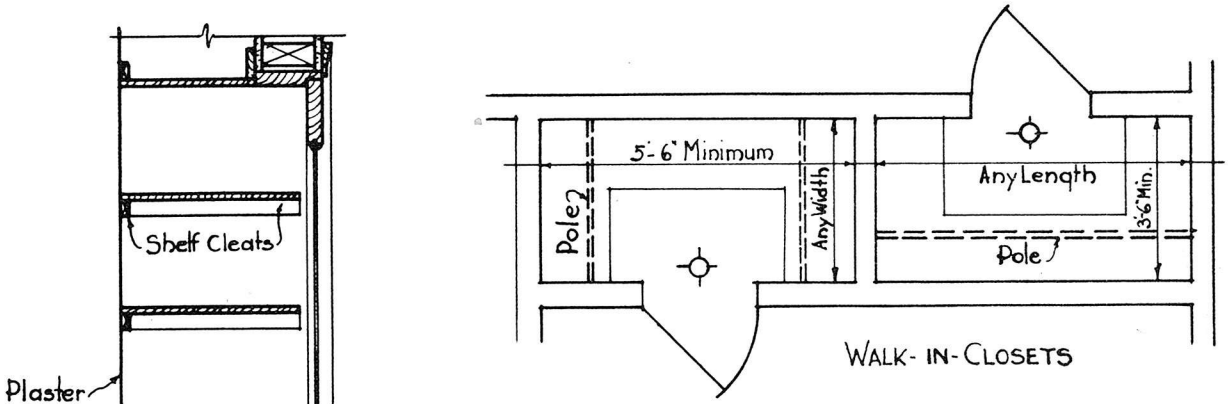
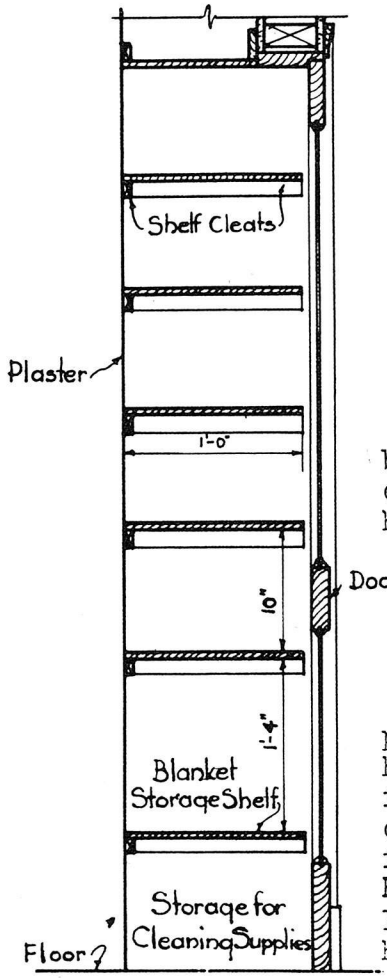


FIG. 3A CLOSET DETAILS

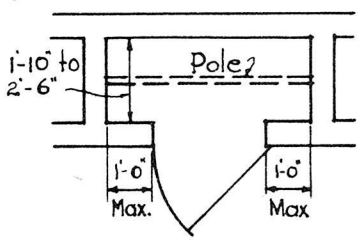


LINEN CLOSET

FIG. 2

bedrooms, or in a bedroom as a combination clothes closet and linen closet. It usually has drawers in the lower part and shelves in the upper part. If the closet is to be used for storage of woolens which might be damaged by moths, it may be lined with 3/8 in. cedar.

Sometimes, the bottom part of a linen closet has a space for a hamper for soiled clothes or a chute to the basement for the same purpose. Figure 2 shows a typical linen closet for a small home.



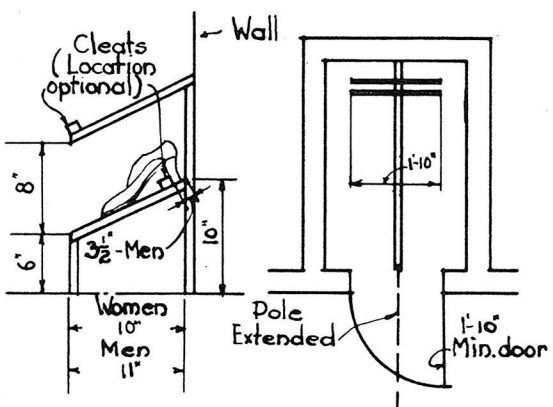


FIG. 3B

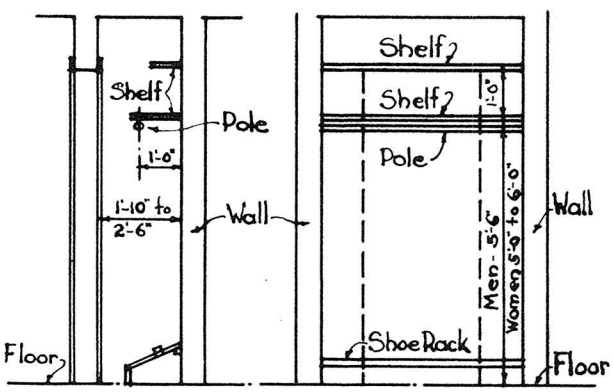


FIG. 3C

CLOSET DETAILS

CLOTHES CLOSETS

Clothes closets are generally located in bedrooms. They should be provided with the necessary drawers, shelves, hanging rods and hook strips for the storage of wearing apparel. Figures 3A, 3B and 3C show how wall and floor space in a closet might be used.

Figure 4 shows a section of a series of trays and shelves that may be used in a large or small clothes closet or in a linen closet. The dimensions of the trays are such that they are convenient for towels, bed linen and wearing apparel.

SELECTED REFERENCES

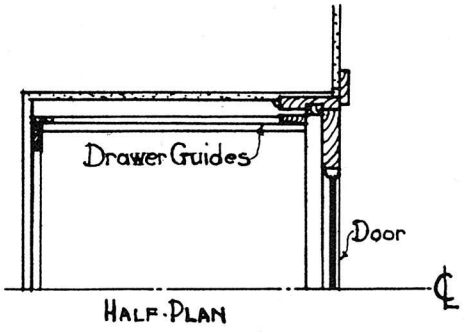
Millwork Catalogs .....

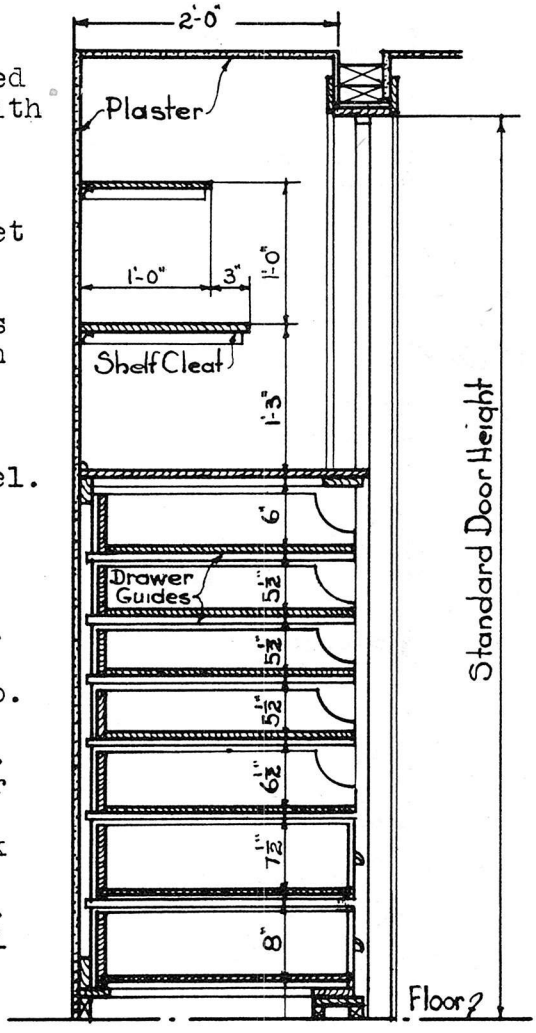
Sweet's Catalog File ..... Dodge Corp.

Architectural Graphic Standards ..... Ramsey and Sleeper

House Construction Details ..... Burbank

How to Plan a House ..... Townsend and Dalzell





SECTION

FIG. 3

LINEN CLOSET WITH TRAYS

HOW TO BUILD INTERIORS OF CLOTHES AND LINEN CLOSETS

OBJECTIVES OF THE UNIT

1. To show how to install shelving.
2. To show how to install drawers and cabinet frames.
3. To show how to install clothes hangers.

INTRODUCTORY INFORMATION

The various operations in building cabinets and closets are similar to those described for kitchen cabinets and interior trim. This unit will only describe the processes not previously covered.

TOOLS AND EQUIPMENT

Rule	Hammer	Hand drill
Crosscut saw (fine)	Nail set	Brace, 3/4 in. bit
Rip saw	Compass saw	Scriber
3/4 in. chisel	Spoke shave	Sliding T bevel
Plane	Rabbet plane	Spirit level

PROCEDURE

HOW TO BUILD AND INSTALL A MEDICINE CABINET

NOTE: Medicine cabinets of standard sizes may often be obtained more cheaply from a lumber dealer than the carpenter can build them on the job. However, if special sizes are to be built, the drawing in Fig. 1, Unit 1C-T76 may serve as a guide.

1. Lay out the side jambs and cut the dadoes for the top and bottom.
2. Lay out and cut the shelf dadoes as shown in Fig. 1, Unit 1C-T76.
3. Assemble and square the frame.
4. Apply 1/4 in. plywood for the back of the cabinet.
5. Apply the casings the same as the interior window casings.
6. Set the frame in the opening in the bathroom wall. Level, plumb and nail the cabinet jambs to the sill and uprights of the rough opening. Nail the casings to the wall surface.
7. Fit the door in the same way the kitchen cabinet doors were fitted.

8. Cut shelves to fit into the dadoes.

HOW TO BUILD A LINEN CLOSET

NOTE: Figure 2 of Unit 1C-T76 shows how the shelves are arranged and supported by cleats nailed to the wall.

1. Mark the locations of the shelf cleats on one end wall of the closet. Use a spirit level to get these marks on the opposite end wall at the same height. Nail the shelf cleats to these marks on the walls.

2. Cut, fit and nail the shelves on the cleats.

3. Fit the doors, allowing 3/4 in. clearance between the floor and the bottom of the lower door.

HOW TO INSTALL CLOTHES CLOSET SHELVES AND DRAWERS

NOTE: Fig. 3, Unit 1C-T76 shows how clothes closet equipment may be built. There are no new processes involved.

The drawers shown in Fig. 4, Unit 1C-T76 may be made similar to those of the kitchen cabinet except that the drawer sides are curved at the front edge to meet a narrow drawer front.

DESCRIPTION OF BOOKCASES AND MANTEL SHELVES

OBJECTIVES OF THE UNIT

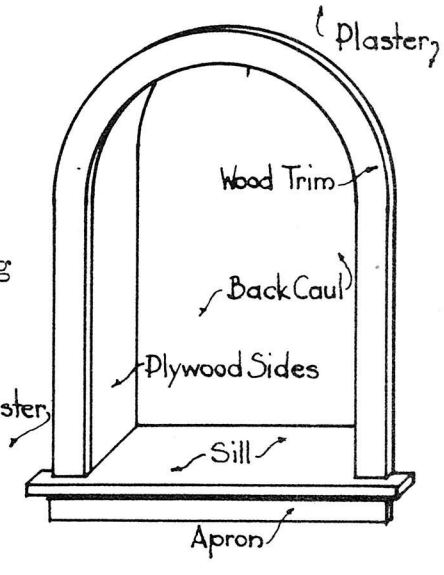
1. To describe a recessed niche.
2. To describe built-in bookcases and corner cabinets.
3. To describe mantel shelves.

INTRODUCTORY INFORMATION

Recessed openings are often made in the wall for small shelves, a telephone or for ornaments. Larger shelves require a framed cabinet permanently built on the wall or around a fireplace.

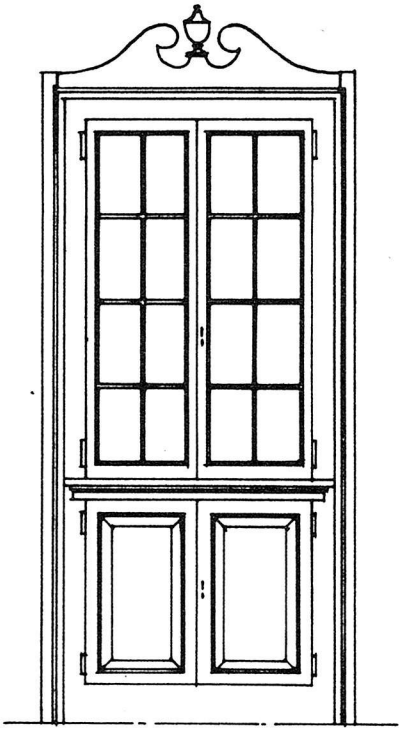
RECESSED NICHES AND SHELVES

Recessed openings should be avoided in outside walls if possible. If they must be put in outside walls, they should be carefully insulated. The width of these openings is generally the distance between two studs. If the opening must be wider, the proper headers should be installed in the framework of the building. A frame similar to that of the medicine cabinet with a plywood back and adjustable shelves is used when the opening is cased. If casings are omitted and the opening is arched, the framework of the opening is made of thin plywood bent to form the arch. Figure 1 shows a typical wall niche.



WALL NICHE

FIG. 1



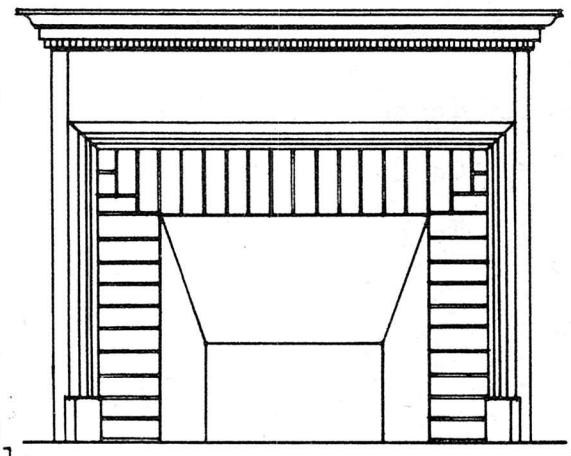
CORNER CABINET

FIG. 2

CORNER CABINETS

Corner cabinets are sometimes built into the corners of rooms to hold dishes or ornaments. They may be obtained from a mill in knocked down or in completed form, or they may be framed by the carpenter in the same

general manner as kitchen cabinets. Figure 2 shows one type of corner cabinet. The cabinets may have either an open front or glazed doors.



FLUSH MANTEL

FIG. 3

BUILT IN BOOKCASES

Bookcases are frequently built in the living room. They are often built in conjunction with mantel shelves and around fireplaces. They may have glazed doors but more frequently they are built without doors and have adjustable shelves. The style and layout of bookcases depends on the space available but the general framing and shelf construction is similar to that of kitchen cabinets except that there should be a piece of plywood at the back of the case and the shelves should be adjustable.

MANTEL SHELVES

The fireplace is usually decorated by placing a mantel shelf above the opening. This shelf may be almost any height and size depending upon the shape and size of the chimney.

When the brickwork of the fireplace is built flush with the plaster line, a casing, frieze and cap is built around the brickwork. The cap forms a shelf as shown in Fig. 3.

Mantels and fireplace trim may be built by the carpenter or may be obtained in standard sizes and styles from the mills and assembled on the job.

SELECTED REFERENCES

House Construction Details ..... Burbank

Architectural Graphic Standards ..... Ramsey and Sleeper

Millwork Catalogs .....

HOW TO BUILD A RECESSED NICHE, CORNER CABINET AND MANTEL SHELF

OBJECTIVES OF THE UNIT

1. To show how to build an arched niche.
2. To show how to build a corner cabinet.
3. To show how to build a bookcase.
4. To show how to build a mantel shelf.

INTRODUCTORY INFORMATION

Mantel shelves, bookcases, cabinets and niches are generally made at the mill and delivered to the job ready to be installed or assembled by the carpenter. However, there are times when it is necessary to build them on the job. This unit will give the new processes used in the construction of these units.

TOOLS AND EQUIPMENT

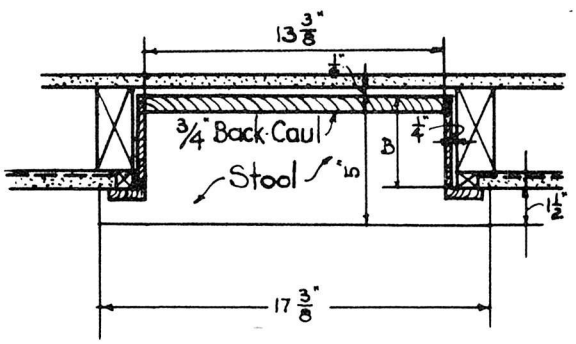
Rule and pencil	Hand drill and drills	Nail set
Combination square	Countersink	Hammer
Crosscut saw, 10 pt.	Jack plane	Brace and bits
Compass saw	Block plane	Scriber
Rip saw		3/4 in. chisel

PROCEDURE

HOW TO BUILD A RECESSED NICHE

NOTE: Assume that a niche similar to that shown in Fig. 1, Unit 1C-T77 is to be built with wood framing and casings.

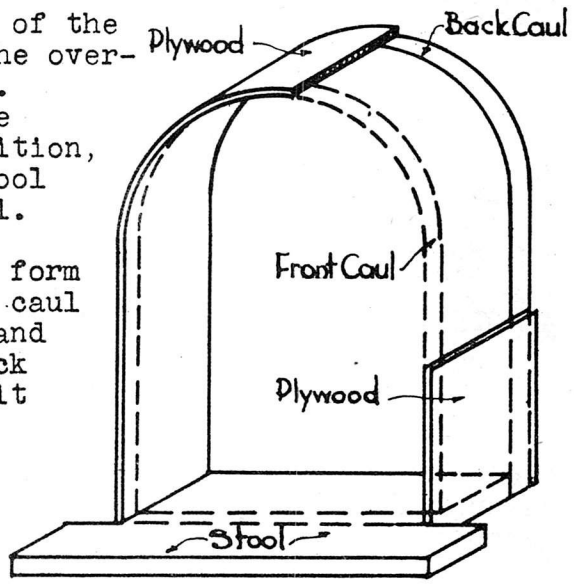
1. Measure the width, height and depth of the opening in the wall.
2. Lay out and cut 25/32 in. material 1 1/2 in. wider than the depth of the opening and about 4 in. longer than the width of the cabinet opening.
3. Lay out this piece like a window stool as shown in Fig. 1.



PLAN OF NICHE STOOL

FIG. 1

NOTE: Allow 3/4 in. for the back of the niche, and 1 1/2 in. for the overhang over the plaster line. Assuming the niche is to be placed in a 3 5/8 in. partition, the measurements of the stool would be as shown in Fig. 1.



FRAMEWORK OF NICHE

FIG. 2

4. Cut two cauls of 3/4 in. stock to form the arched jamb piece. The front caul should be as high as the opening and 13 3/8 in. wide (Fig. 2). The back caul should be 3/4 in. higher so it can be nailed against the back of the stool.

5. Temporarily nail the front caul to the stool as shown by the dotted lines in Fig. 2. Nail the back caul flush with the bottom of the back edge of the stool.

6. Measure with a flexible rule the length of the plywood that will make up the sides and arch of the niche.

7. Cut a piece of thin plywood to this length and to the width B in Fig. 1.

8. Nail one end of the plywood to one end of the stool and bend it around the cauls. Nail it to the other end with 1 1/4 in. flat head nails.

9. Nail the back edge of the plywood to the back caul and remove the front caul.

10. Lay out and cut a casing from 1/2 in. or 25/32 in. stock about 2 1/4 in. wide.

NOTE: Use a radius 1/4 in. less than when laying out the cauls. This will allow the casing to overlap the edge of the plywood at the front of the niche.

11. Fit and nail the casing to the stool, arched jamb and plastered wall.

12. Fit, nail and return a small moulding underneath the stool.

HOW TO BUILD A CORNER CABINET

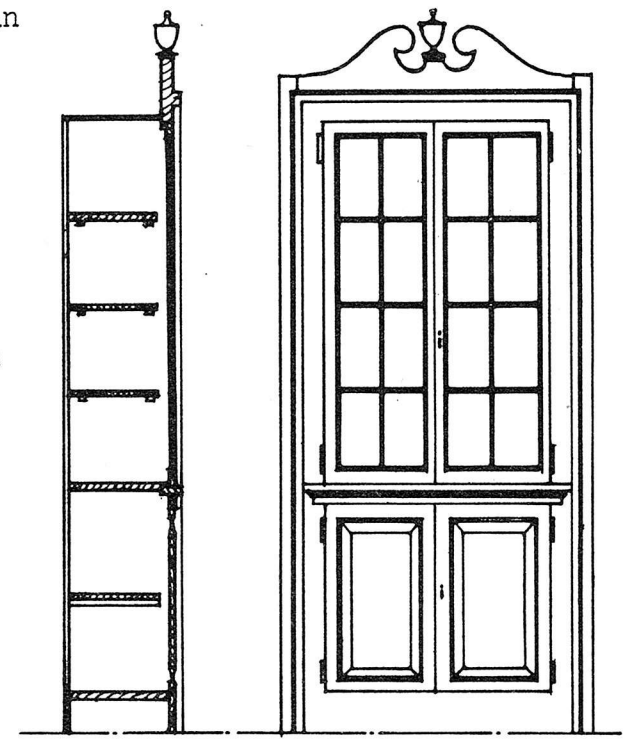
NOTE: Figure 3 shows a typical corner cabinet.

1. Lay out on the subfloor an exact floor plan of the cabinet showing the outline of the stiles, door opening and shelves.

2. Make the front frame to these dimensions and heights (Fig. 3).

3. Lay out and cut the shelves to the size shown on the floor plan.

4. Lay out and cut the back boards of the cabinet. The lengths, widths and bevel cuts may be found by temporarily nailing the top, middle and bottom shelves to the front frame and fitting the back board around the back contour of the shelves as shown in Fig. 3. The back may be 25/32 in. stock or 1/2 in. plywood.



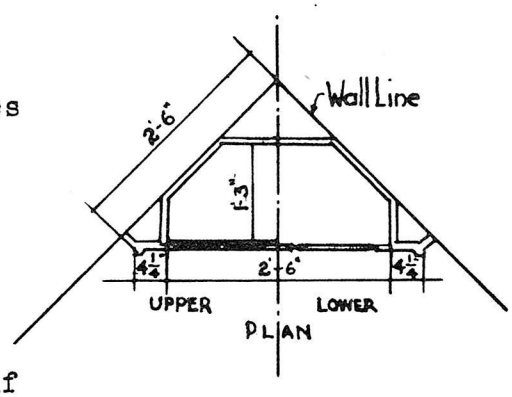


FIG. 3
CORNER CABINET

5. Square the assembled frame, shelves and back boards.

   NOTE: If these shelves are to be adjustable, metal shelf support strips such as shown in Fig. 4A may be used or strips of wood 3/8 in. x 1 in. may be cut out to hold the wooden shelf supports. See Fig. 4B.

6. Cut out and place the required shelf supports on the back boards.

7. Notch the adjustable shelves around the supports so they may be easily removed.

8. Fit and nail the side casings of the front frame to the wall surface.

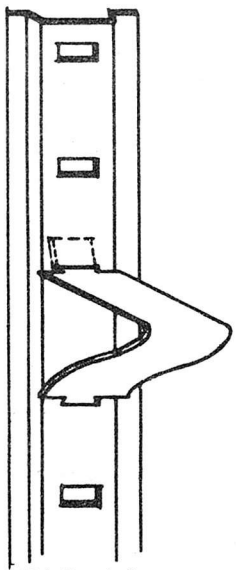


FIG. 4A

METAL SHELF SUPPORT

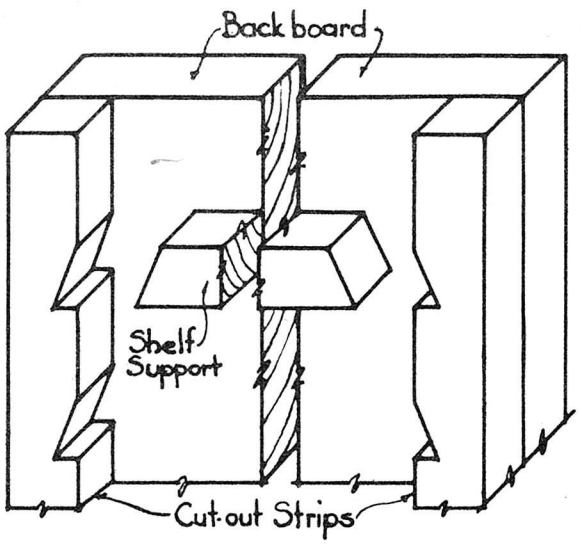


FIG. 4B

WOODEN SHELF SUPPORT

9. Lay out and cut the ornamental head casing from 25/32 in. by 8 in. stock similar in design to the one shown in Fig. 3. Nail it in place.

10. Fit the glazed and paneled doors by the same method used in fitting kitchen cabinet doors.

HOW TO BUILD A MANTEL SHELF ON A FLUSH CHIMNEY

NOTE: Assume that the brickwork is flush with the face of the plaster and that the mantel shelf is supported by pilasters as shown in Fig. 5.

1. Lay out the length and width of the pilasters and frieze according to the size of the chimney. Cut them accordingly.

2. Lay out and build the shelf according to the width of the chimney and similar to that shown in Fig. 5.

3. Assemble the frieze and pilasters by nailing them in a plumb position on the plastered wall and overlapping the sides of the chimney about 1 in.

4. Place wooden plugs in the masonry joints so that the mantel shelf may be securely attached to the masonry surface.

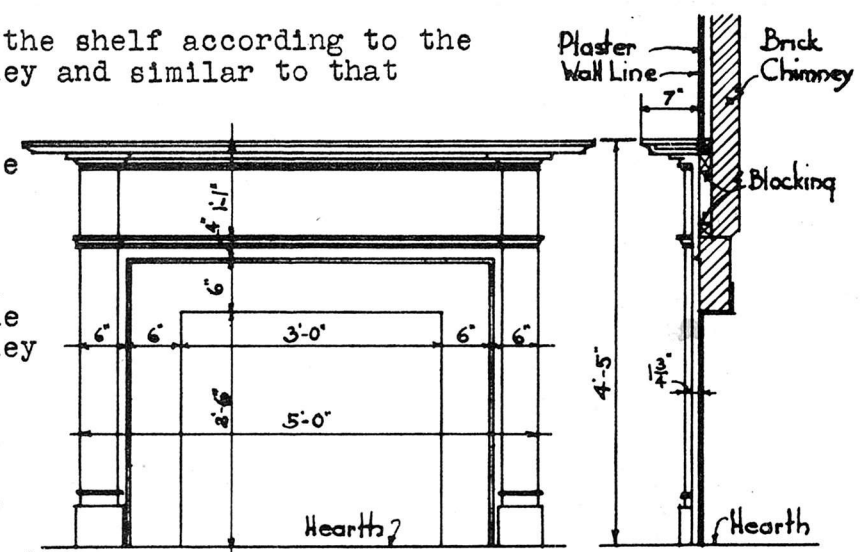


FIG. 5 FLUSH MANTEL SHELF

5. Place the assembled mantel shelf on top of the pilasters across the face of the chimney. Nail it in a level position to the wooden plugs in the joints of the masonry.

   NOTE: It is sometimes necessary to scribe the shelf to the wall surface. A small moulding may be used to cover an unscribed joint.

   The surfaces of the pilasters and frieze may be decorated by fluting, by forming miniature columns and bases, or by mitering mouldings in various designs.

6. Finish the pilaster and frieze surfaces similar to the one shown in Fig. 5. Set all nails and sand the surfaces.

HOW TO BUILD A MANTEL SHELF ON A PROJECTING CHIMNEY

NOTE: When the chimney projects into the room, the recesses at the sides of the chimney are often used for bookcases and the bookcase top is a continuation of the mantel shelf. The bookcase may also set back in a recess with the top level with the mantel shelf as shown in Fig. 6.

1. Build and install the pilasters and mantel shelf as in Fig. 5.

2. Lay out and build the front and back framework according to the dimensions of the space and the height of the doors in Fig. 6.

   NOTE: The framework of the bookcase is made in the same general way as the lower part of the kitchen cabinet.

3. Fit and support the lower shelves in the same manner as the lower shelves of the kitchen cabinet.

   NOTE: Sliding doors are often used in this type of cabinet. In this case, runways should be built at the top and bottom of the door opening in the same general manner as in the sliding window sash. If the doors are to be hinged, they are fitted the same as kitchen cabinet doors.

4. Fit the top and bottom shelves of the upper section in much the same manner as the kitchen cabinet shelves. The partition shown in Fig. 6 is dadoed to these two shelves.

   NOTE: If the shelves are to continue above the mantel shelf and no doors are to be used, a framework or solid end pieces to which shelf supports can be attached may be provided at each end of the recess. Shelves should be installed about 9 in. apart for book storage. If this bookcase is to be built, continue as follows:

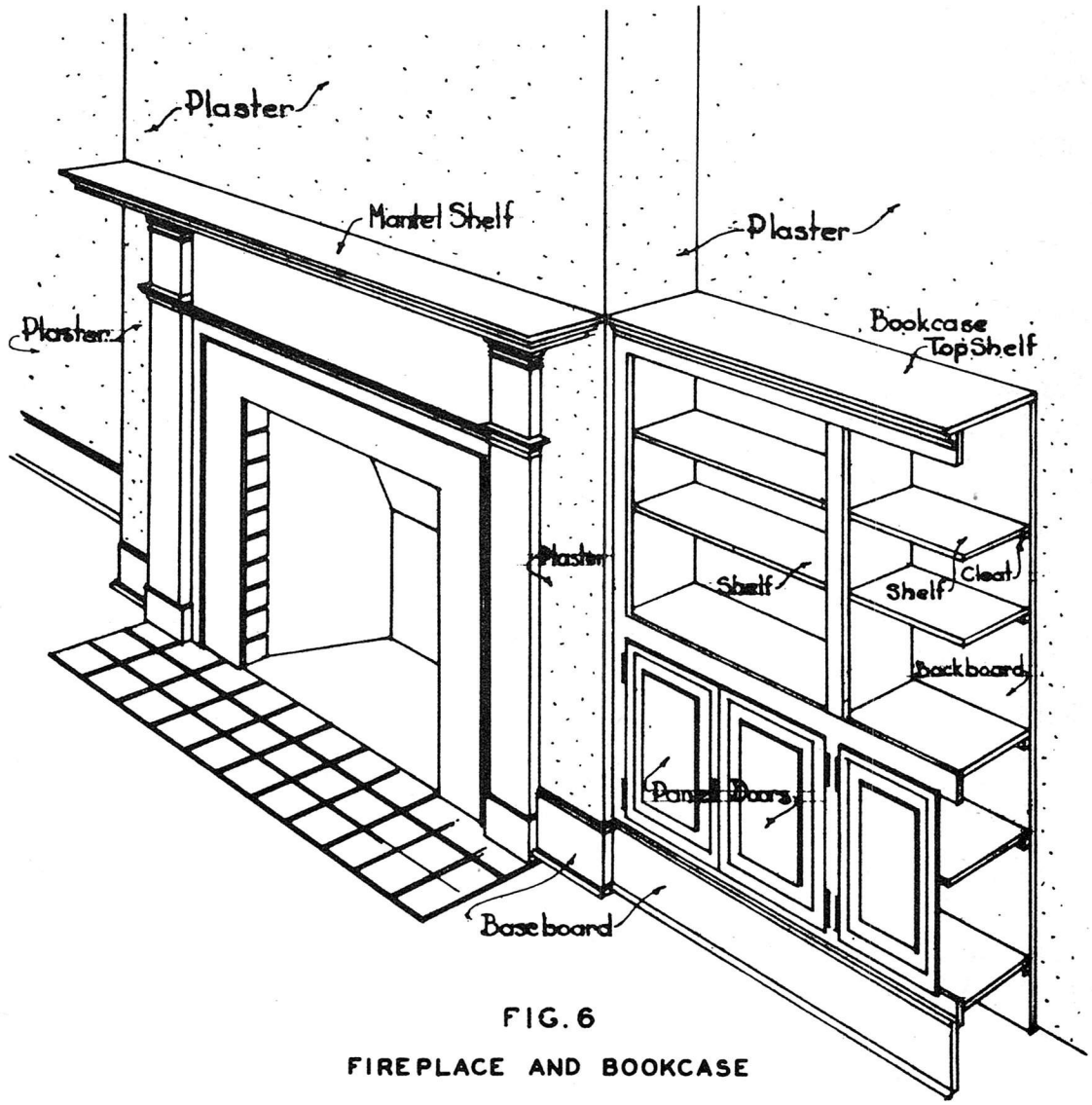


FIG. 6

FIREPLACE AND BOOKCASE

5. Lay out, cut and fit the end wall shelf frames and shelf supports in accordance with the height from the top of the shelf to the ceiling. They should be about 6 in. wide.

6. Arrange for adjustable shelves by using method A or B, Fig. 4.

7. Cut, fit and finish the shelves.

8. Extend the baseboard, shoe and ceiling moulding across the front of the finished bookcase to the fireplace.

9. Set all nails and sand all surfaces and corners.

DESCRIPTION OF FINISH STAIRS BUILT ON CARRIAGES

OBJECTIVES OF THE UNIT

1. To describe the methods of fitting the wall stringers.
2. To describe the methods of fitting the risers.
3. To describe the methods of fitting the treads.
4. To describe characteristics of this type of stairs.

INTRODUCTORY INFORMATION

Units 1C-T55 and 1C-P55 of the monograph "Framing, Sheathing and Insulation" describe the layout of common types of stairs and the construction of stair carriages and bridgework. This unit describes only the application of trim such as stringers, risers and treads.

BUILT-UP STAIR STRINGERS

Since a detailed description of stairs and stair carriages was given in Units 1C-T55 and 1C-P55, no full length stairs will be shown in this unit. Short stairs of three risers will be used. It is assumed that the carriages have been properly placed in the bridgework.

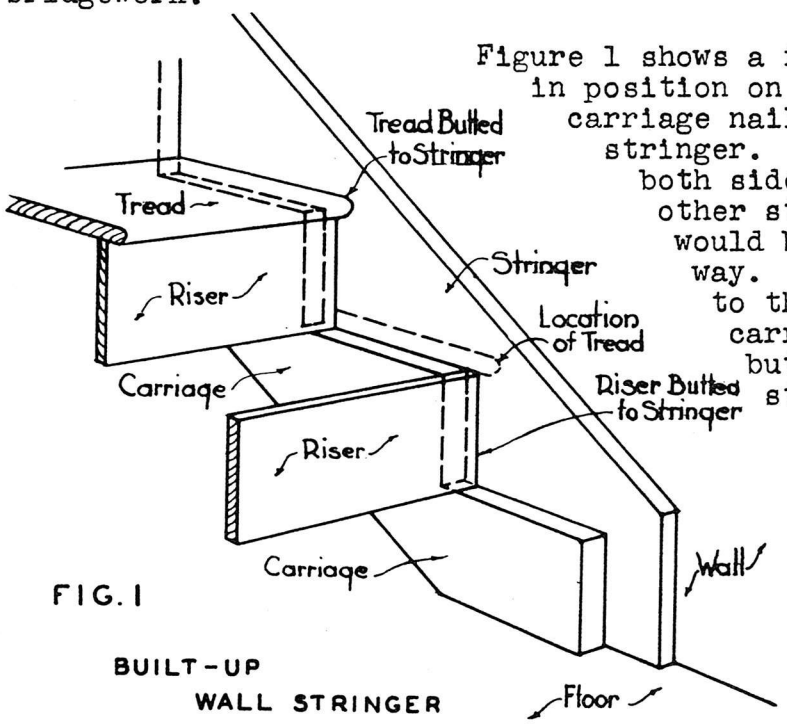


FIG. 1

BUILT-UP WALL STRINGER

Figure 1 shows a finish stringer nailed in position on the wall and the rough carriage nailed in place against the stringer. If there are walls on both sides of the staircase, the other stringer and carriage would be located in the same way. The risers are nailed to the riser cuts of the carriage on each side and butt against each side stringer. The treads are nailed to the tread cuts of the carriage and also butt against the stringers. See Fig. 1. This type of construction is used where the rough carriages were fitted temporarily at the time the stair bridgework was framed.

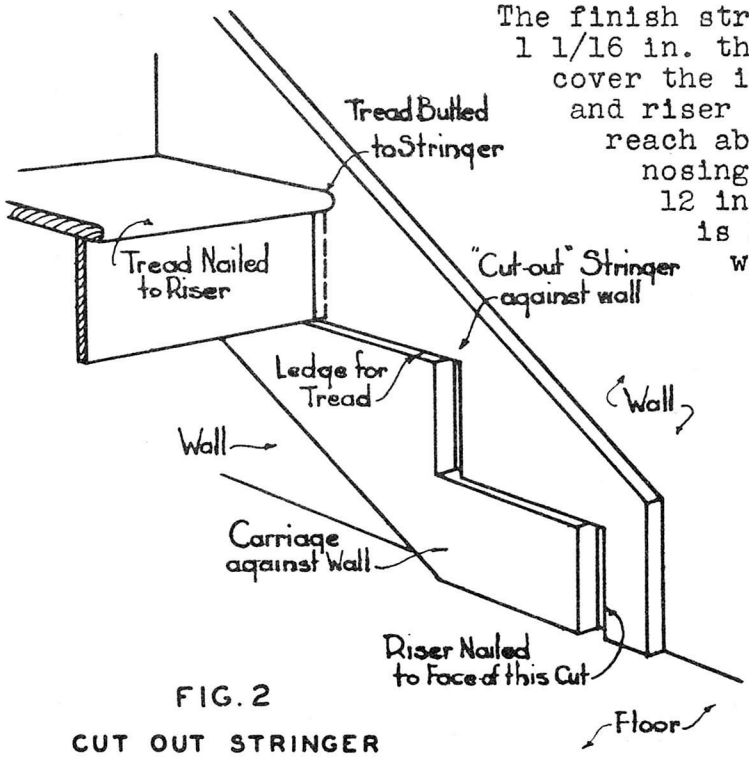


FIG. 2

CUT OUT STRINGER

The finish stringer may be 25/32 in. or 1 1/16 in. thick and wide enough to cover the intersection of the tread and riser cut in the carriage and to reach about 2 in. beyond the tread nosing. This width is usually 12 in. to 14 in. This stringer is laid out in about the same way as a rough carriage but unlike the carriage, it is not cut out at the riser and tread marks. Only the level cut for the floor, the plumb cut for the header, and the plumb cuts at the top and bottom of the stringer for the baseboards are made.

This is perhaps the best type of construction to use when the treads and risers are to be nailed to the carriages. This method saves time and labor in installing stairs but it is difficult to prevent squeaks when the stairs are stepped on. Another disadvantage is that any shrinkage of the frame of the building causes the joints to open up and to present and unsightly appearance.

CUT-OUT STAIR STRINGERS

Another method of fitting the treads and risers to wall stringers is shown in Fig. 2. The stringers are laid out with the same rise and run as the stair carriages, but they are cut out in reverse as shown in Fig. 2. The risers are butted and nailed to the riser cuts of the wall stringers and

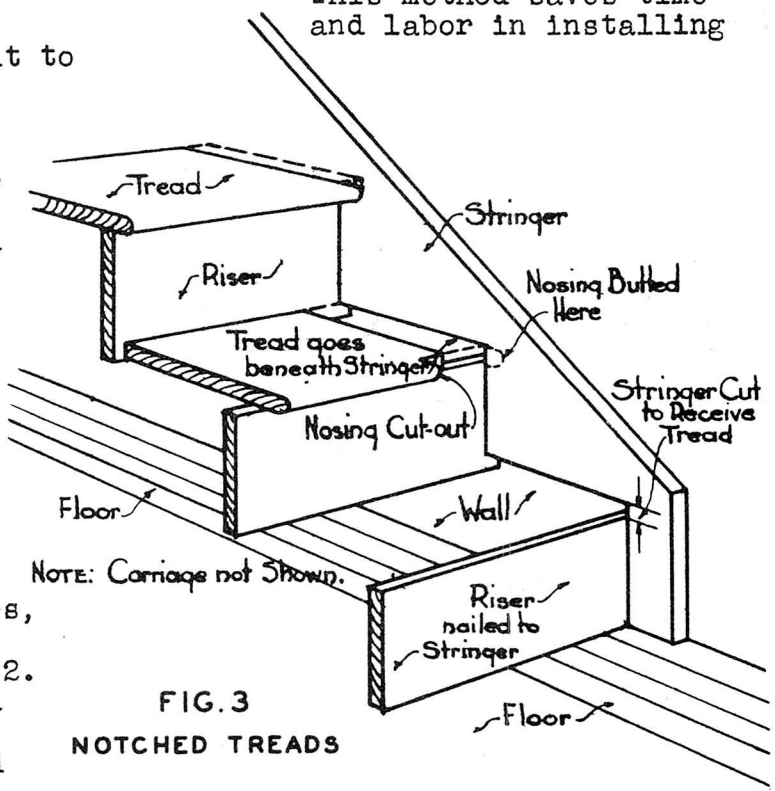


FIG. 3

NOTCHED TREADS

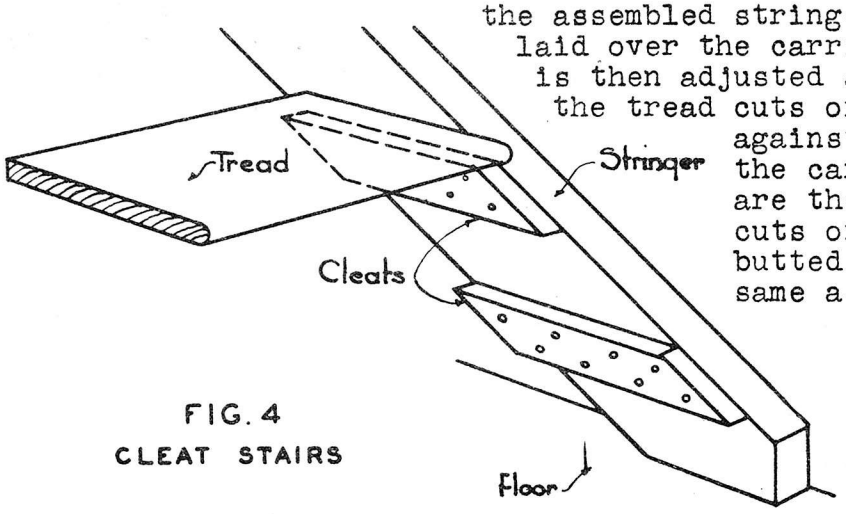


FIG. 4
CLEAT STAIRS

the assembled stringers and risers are laid over the carriage. The assembly is then adjusted and nailed so that the tread cuts of the stringers fit against the tread cuts of the carriages. The treads are then nailed on the tread cuts of the carriage and butted to the stringers the same as in Fig. 1.

This method has the same disadvantages as the built-up type, but has the advantages of having the two stringers tied together by the nailing of the risers to them. This prevents the two side stringers from spreading and showing open joints at the ends of the treads. Since the risers are nailed to the stringers, the face nailing of the risers to the carriages as in Fig. 1 is eliminated. This type of stringer is used where the carriages were fitted permanently to the bridgework at the time when the building was framed.

Sometimes the treads are allowed to run underneath the tread cut of the stringer. This makes it necessary to notch the tread at the nosing to fit around the stringer. See Fig. 3.

BASEMENT STAIRS

Basement stairs may be built either with or without riser boards. The treads may be fastened to the stringers by cleats (Fig. 4). The stringers should be at least 1 5/8 in. thick and wide enough to give a full width bearing for the tread. If cleats are used, they should be at least 25/32 in. thick, 3 in. wide, and as long as the width of the tread. The treads should be at least 1 1/16 in. thick or, if the stairs are more than 3 ft. wide they should be thicker. See Fig. 4.

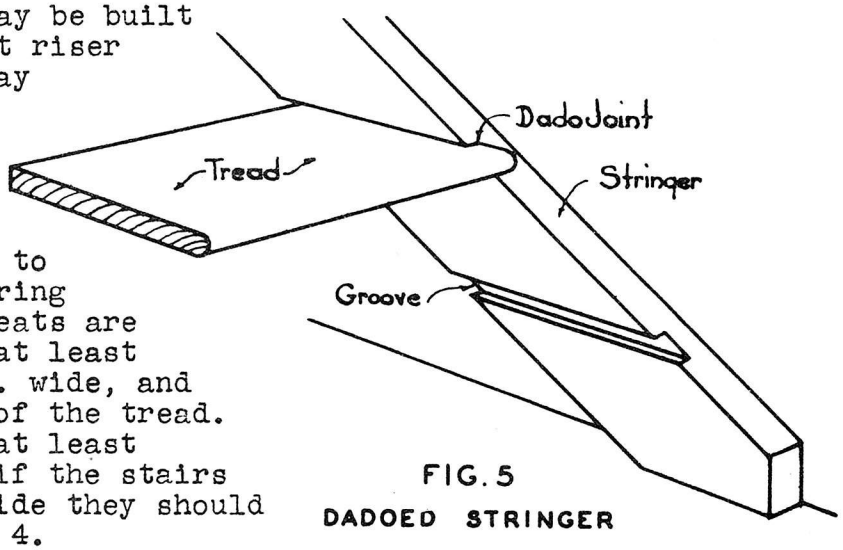


FIG. 5
DADOED STRINGER

Dado joints are often used to hold the treads to the stringers (Fig. 5). This type of construction is quite common in steep stairs or ladders for attic or scuttle openings. If dado joints are used, they should be only one third as deep as the stringer is thick.

SELECTED REFERENCES

Audels Carpenters and Builders Guide #4 ..... Graham and Emery

Stair Building ..... Townsend

Architectural Graphic Standards ..... Ramsey and Sleeper

Millwork Catalogs .....

HOW TO BUILD FINISH STAIRS ON CARRIAGES

OBJECTIVES OF THE UNIT

1. To show how to make a built-up stringer.
2. To show how to make a cut-out stringer.
3. To show how to fasten risers to stringers.
4. To show how to fasten treads to stringers.
5. To show how to assemble stairs.

INTRODUCTORY INFORMATION

A detailed description of the processes of laying out, cutting and erecting stair carriages may be found in Unit 1C-P55 of the monograph "Framing, Sheathing and Insulation". This description will not be repeated in this unit.

TOOLS AND EQUIPMENT

Crosscut saw, 10 pt.
Rip saw
Steel square
Plane
3/4 in. chisel
Hammer
Nail set
Rule - pencil

PROCEDURE

HOW TO BUILD STAIRS WITH BUILT-UP STRINGERS

NOTE: It is assumed that the temporary carriages have been removed and new ones are to be made, and that the finish lumber to be used in the stair case is clear stock and sanded.

1. Lay out and cut the stair carriages as outlined in Unit 1C-P55 of the monograph "Framing, Sheathing and Insulation". Use 1 5/8 in. stock.
2. Select the stair stringers of the proper thickness, width and length and lay out the exact length and the bottom and top cuts. Make the line of the bottom cut level to meet the floor line and the line of the baseboard cuts plumb to meet the baseboard at the top and bottom of the stair (Fig. 1).
3. Lay out a right and a left hand stringer and cut along the bottom and top marks on the stringer.

4. Nail the right hand stringer to the stair carriage, keeping the bottom level cut of both pieces even and the top edge of the stringers at least 4 in. above the cut outs of the carriage. See Fig. 1.

   NOTE: Be sure the bottom edge of the carriage is parallel with that of the stringer.

5. Nail the left hand stringer to a carriage in the same manner.

6. Place the built-up stringers in their proper places against the header and side walls of the stair opening. Nail them to the headers and side walls as described in Unit 1C-P55.

7. Select the required number of riser boards. These are generally 25/32 in. thick, 7 1/2 in. wide, and as long as the distance between the inside faces of the two stringers.

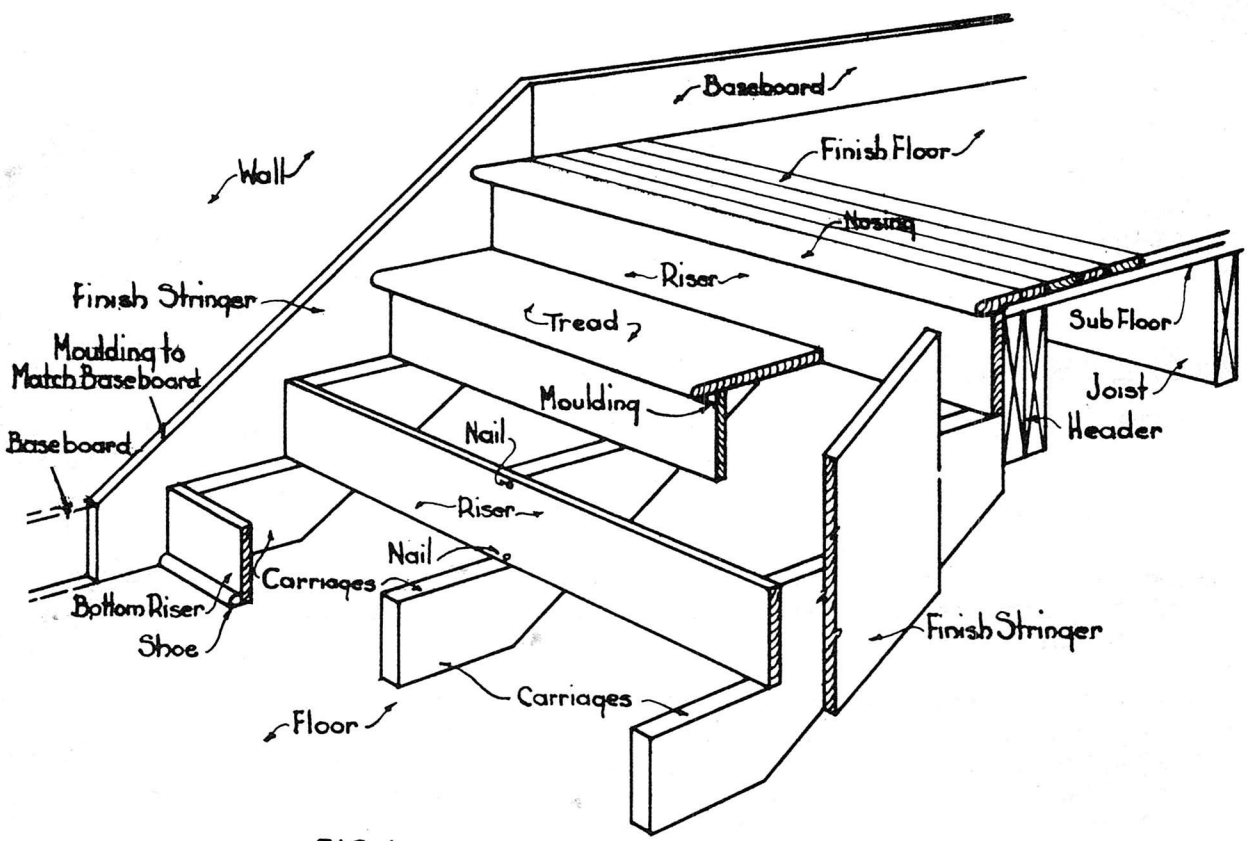


FIG. 1

BUILT-UP STRINGER STAIRS

8. Rip a riser board for the first riser to a width equal to the height of the first tread cut of the carriage above the floor. See the bottom riser of Fig. 1. Square the ends of this riser to length so that it fits tightly against the finish stringer on each side of the stairs.

9. Face nail the riser board to the riser cuts of the three carriages with two 8d finishing nails in each carriage. Keep the nails about 1 in. from the top and bottom edges of the board (Fig. 1).

   NOTE: The nails at the top will be covered by the moulding that is to be placed underneath the tread nosing and the nails at the bottom of the riser will be covered by the floor shoe, or on the other risers, by the thickness of the tread.

10. Cut, fit and nail the remaining riser boards in a similar manner.

11. Cut the treads to the same length as the riser boards and fit them in place. Face nail them with three 8d finishing nails at each tread cut of each carriage.

    NOTE: After each tread is face nailed, drive 8d common nails through the back of each riser board into the back edge of each tread. Space the nails every 8 in. between the carriages.

12. Cut a piece of rabbeted nosing stock to the same length as a tread and face nail it to the top edge of the top riser and to the subfloor. Set all nails that will show and resand the surfaces where necessary.

13. Fit and nail cove moulding under the nose of each tread.

HOW TO BUILD STAIRS WITH CUT-OUT STRINGERS

NOTE: When cut-out stringers are used, the same general procedure is followed except that the finish stringers are cut to fit against the tread cuts of the carriage and the face of the riser boards. The risers extend the full width of the stair opening. See Fig. 2, Unit 1C-T78.

It is assumed that the carriages are permanently placed so the finish stringers, risers and treads will fit them.

1. Lay out the finish right and left hand stringers using the same figures as on the carriages. Mark the cuts at the top and bottom of the stringers for the floor and baseboard cuts. These cuts should be the same as shown in Fig. 1.

2. Lay out the riser and tread cuts.

3. Cut along these marks with a crosscut saw. Be careful not to break the wood where the riser and tread cuts meet.

4. Temporarily nail a stringer to the plastered wall on the left hand side of the stair opening. Keep the riser cuts of the stringer approximately 1 1/4 in. from the riser cuts of the carriages and the tread cuts of the stringer on top of the tread cuts of the carriage.

5. Measure the distance between the plastered walls at the top and bottom of the stairs to find the lengths of the riser boards.

6. Cut riser boards 1/2 in. shorter than these lengths.

7. Place the top riser board between the riser cut of the left hand stringer and the riser cut of the carriage.

8. Place the right hand stringer in the proper position on the right hand plastered wall of the opening.

9. Mark the face of the riser board along the inside surface of both stringers. Be sure that there is a space of 1/4 in. on each side between the outside of the stringers and the plastered wall.

10. Follow the same procedure for the bottom and intermediate riser boards.

11. Remove the stringers and risers. Face nail the risers to the riser cuts of the stringer, keeping the tops of the risers tight against the tread cuts of the stringers and the face of the stringer in line with the marks on the faces of the risers. Nail the riser boards to both stringers in the same way. See Fig. 2, Unit 1C-T77.

12. Replace the assembled stringers on the carriages and adjust them so that the riser boards are tight against the riser cuts of the carriage and the tread cuts of the stringers are tight against the tread cuts of the carriages.

13. Nail the stringers to the walls in this location.

14. Cut, fit and nail the treads in the same way as for the built-up stringer.

NOTE: Some carpenters prefer to allow the treads to run under the stringers the same as the risers. See Fig. 3, Unit 1C-T78. The stairs in this case are built in practically

the same way except that in laying out the cut-out stringer no deduction is made at the bottom riser mark for the thickness of the tread. The treads are notched to fit underneath the stringers at the nosings.

HOW TO BUILD BASEMENT STAIRS

1. Select the required stock. Use clear dressed stock free from defects.

2. Lay out the stringers in the same way as in laying out carriages.

   NOTE: If the treads are to butt against the stringers and are to be supported by cleats, the tread marks on the stringers represent the tops of the finish treads and the top of the cleat should be the thickness of the tread below this line. See Fig. 4, Unit 1C-T78.

   If the treads are to be dadoed into the stringers, assume that the tread marks on the stringers represent the tops of the dado cuts. See Fig. 5, Unit 1C-T78.

3. Determine the length of the treads and cut the required number to this length.

4. Cut the required number of cleats and chamfer the edges that will show.

5. Nail the cleats to the proper marks below the tread marks on the stringers. Use nails long enough to reach within 1/2 in. of the combined thickness of the stringers and cleat.

6. Assemble the treads in place on the cleats or in the dadoes and nail through the stringers into the ends of the treads. Use 16d common nails if the stringers are 1 5/8 in. thick and cleats are used, or 10d casing nails if dado joints are used.

7. Square the assembled stairs and fasten them in place in about the same way as stair carriages are fastened.

   NOTE: If the lower floor and side wall is of masonry, some means should be used to fasten the stringers firmly to these surfaces. Expansive shields and lag screws or wood blocks inserted into the masonry may be used for this purpose.

DESCRIPTION OF STAIRS BUILT WITH HOUSED STRINGERS

OBJECTIVES OF THE UNIT

1. To describe the method of laying out housed stair stringers.
2. To describe the making of tread and riser templets.
3. To describe the assembly of stringers, risers and treads.

INTRODUCTORY INFORMATION

Housed stair stringers are frequently considered a mill job but these stringers may be housed by the carpenter. The methods used in laying out the stringers, cutting the risers and treads and assembling the stairs are quite similar to these processes in other stairwork. In this unit only the closed stringer type of housed stringer will be considered.

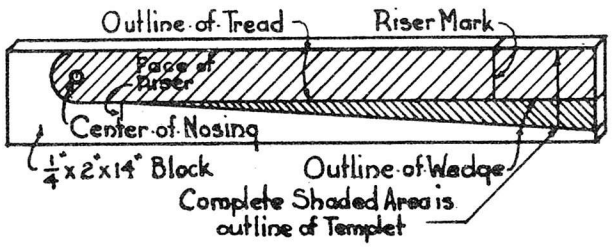
DESCRIPTION OF THE CLOSED STRINGER TYPE OF STAIRCASE

A closed type of housed stringer staircase is one which is enclosed by walls on both sides of the staircase. The stringers are housed out to receive the ends of the treads and risers. This type is similar to the cut-out type described in Unit 1C-T78 in which the treads and risers extend through the thickness of the stringer. In this case they only extend approximately 3/8 in. into the stringers. The treads and riser boards are then wedged into the dado joints of the stringers. See D, Fig. 1.

HOUSED STRINGER LAYOUT

Figure 1 shows a housed stringer in various stages of construction. The lay out of the treads and risers is similar to that of the cut-out type of stair stringer except that before the stringer is laid out, a mark is gauged about 1 1/2 in. from the bottom edge on the face of each stringer. See XY, Fig. 1. This line acts as a measuring line the same as in laying out roof rafters. The purpose of using this line instead of the edge of the stringer is to provide room for the riser and tread boards to be supported by the wedges. The steel square at A, Fig. 1 shows the position in which it is used on the gauge line in laying out the stringer.

The marks of the individual risers and treads represent the outside faces of the tread and riser boards when they are placed in the stringers. In order to form the proper dado outlines for the risers, treads and wedges, riser and tread templets are made and placed at the riser and tread marks on the stringers as shown in B, Fig. 1.



TREAD TEMPLET

FIG. 2

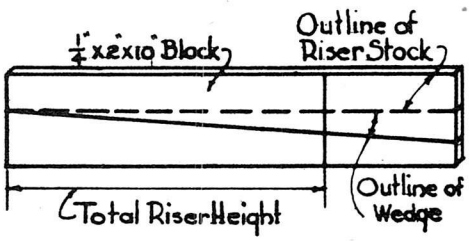
FIG. 1

HOUSED STRINGER

The tread templet is laid out by drawing a straight line on the face of a board about 1/4 in. by 2 in. by 14 in. On this line is drawn the exact end section of the tread stock to be used and also the outline of the wedges to be used to tighten the tread boards in the dado joints of the stringer. See Fig. 2. The exact width of the tread stock including the nosing is measured and marked on the templet as shown by the riser mark in Fig. 2. This mark is also placed on the other face of the templet so that the templet may be used for both the right and left hand stringers. The center of the nosing profile is also located as shown in Fig. 2. This mark is transferred to the other side by drilling a small hole through the templet.

The riser templet is laid out in the same way by using the end section of a riser board and the wedge outline on a thin piece of board as for the tread templet. See Fig. 3. This templet is placed with its straight edge along the riser marks on the stringer. The outline of the templet is then marked along the tapered side of the templet on the stringer face. See B, Fig. 1.

The tread templet is placed in a similar manner with its straight edge on the tread mark of the stringer and the riser mark (Fig. 2) in line with the riser mark on the stringer. See B, Fig. 1. The location of the hole in the templet is marked on the stringer with a scratch awl. This point shows the center of the hole that is to be bored in the stringer to form the round end of the dado to fit the nosing of the tread.



RISER TEMPLET
FIG. 3

The layout at the top end of the stringer where the baseboard and the stringer meet is shown in E, Fig. 1. The nosing at the floor line is laid out with the tread templet to show the same nosing projection from the face of the riser as on the other treads. The nosing should be housed out in the same manner as the other treads. The riser cut directly below the nosing is cut completely through the stringer and the top riser is nailed to this surface. The depth of the tread and riser dado cuts is shown at C, Fig. 1.

The length of the treads is determined and they are inserted into the tread dadoes. They are then wedged, glued, and nailed from the outside of the stringers and into the ends of the treads. All risers, except the top one, are cut to the same length as the treads. The top riser is about 1 1/4 in. longer as it does not fit into the dado cuts but extends to the outside of the stringers. The other riser boards are inserted, wedged, glued and nailed into the riser dadoes the same as the treads. Moulding is sometimes fitted between the stringers under the nosing of the treads. Figure 1 at D shows one riser and tread in place in the housed dadoes and the wedges glued to the undersides of the treads and risers.

Some stairs are built with a rabbeted joint at the back of the tread and also at the top of the riser. However, if the treads and risers are properly jointed, driven up tight, wedged and nailed in this position, the butt joint is satisfactory and saves much labor.

Stock for the various parts of stairs is generally obtained from a mill in partially finished form. Treads and risers may be obtained completely machined and sanded but somewhat oversize. Rabbeted nosing stock for the edge of a landing or for the top step is usually obtainable in rough lengths. Standard wedges are also available. If the mill is furnished with the exact dimensions of the stair well, the parts can be completely machined and then assembled on the job.

SELECTED REFERENCES

Stair Building ..... Townsend
Audels Carpenters and Builders Guide #4 ..... Graham and Emery

HOW TO MAKE HOUSED STRINGERS AND ASSEMBLE STAIRS

OBJECTIVES OF THE UNIT

1. To show how to make riser and tread templets.
2. To show how to use the templets.
3. To show how to house the stringers.
4. To show how to fasten the treads, risers and stringers.
5. To show how to erect and finish the stairs.

INTRODUCTORY INFORMATION

Housing the risers and treads into the stringers is the best method of building stairs. Since it is frequently used in house construction, the carpenter should know how to build some of the simpler types. The use of portable machines makes these processes rather simple but only hand processes will be described in this unit.

TOOLS AND EQUIPMENT

Carpenter's work bench
Steel square
Brace and 1 in. Forstner or center bit
1 1/2 in. butt and 3/4 in. firmer chisel
Router plane
Marking gauge
Miter box
Wood wedges
Liquid glue
Hammer and mallet
Plane
Pencil
Scratch awl
Nail set
Crosscut saw, 10 pt.
Rip saw
Back saw

PROCEDURE

HOW TO MAKE TREAD AND RISER TEMPLETS

NOTE: It is assumed that the tread stock is 1 1/16 in. thick and is nosed.

1. Select a straight piece of stock approximately 1/4 in. thick, 2 in. wide and 14 in. long.
2. Lay out and plane one edge of the templet straight and square and taper the opposite edge as shown in Fig. 2, page 210.

NOTE: Be sure the width of the templet at the nosing is exactly 1 in.

3. Select a similar piece of wood and lay out and cut the templet for the risers. See Fig. 3, page 210.

HOW TO LAY OUT AND HOUSE THE STRINGERS

1. Select the stringer stock. This should be at least 1 1/16 in. thick and from 10 1/2 to 14 in. wide. The length depends on the length of the stairs. Allow about one foot at each end for the top and bottom cuts of the stringer.

   NOTE: Sometimes regular tread stock is used for stringers. If so, plane the nosed surface flat so that moulding may be fitted to this surface after the stairs are in place.

3. Plane the bottom edge of the stringer straight.

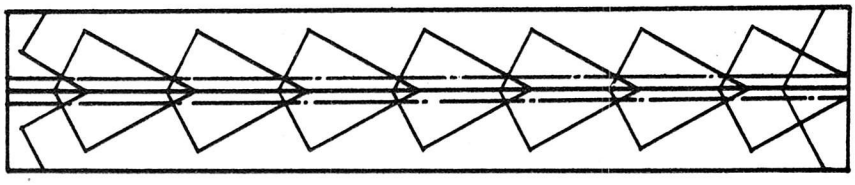
4. Set a marking gauge to about 1 1/2 in. and gauge a line from this edge. See Fig. 1, page 210.

5. Lay out the tread and riser marks with a steel square. Use a scratch awl or a fine hard lead pencil in marking the stringers.

   NOTE: It is well to make a pitch board or to use a fence on the steel square. Refer to the monograph "Concrete Form Construction" for making of a pitch board and to "Framing, Sheathing, and Insulation" for the making of a fence for a steel square. It is important that these jigs be used in laying out stringers so that both side stringers of the stairs will be exactly the same length. Otherwise the stairs cannot be assembled accurately and one stringer may be lower than the other.

6. Lay out the right and left hand stringers and check them for accuracy and length before doing any templet or housing work. Figure 1 shows how to check the stringers for length and accuracy of layout.

7. Place the tread templet with its straight edge exactly over a tread mark on the stringer. Adjust it so that the riser mark on the templet is also exactly in line with the riser mark on the stringer. Make a point on the stringer by putting the scratch awl through the hole in the templet to locate



CHECKING STAIR LAYOUT
FIG. 1

the center of the nosing. Also mark along both sides of the templet on the stringer. See B, Fig. 1, page 210.

8. Bore a hole with a Forstner or center bit using the point marked through the tread templet as a center. Bore the hole approximately 3/8 in. deep. Locate the center of a second hole so it will overlap the first and be within the top and bottom lines of the tread. See Fig. 2.

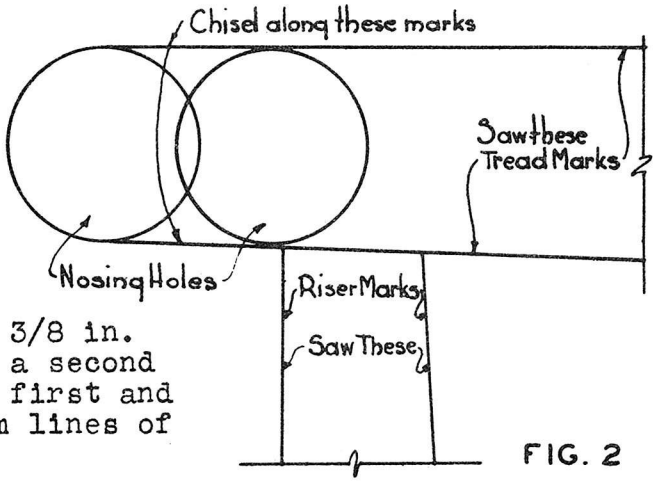


FIG. 2

NOSING CUTS

9. Use the back of a 1 1/2 in. butt chisel to chisel along the tread marks between the holes (Fig. 2).

10. Cut 3/8 in. deep along the tread marks with a back saw. Start with the tip of the saw at the holes and continue back the length of the tread mark.

NOTE: In using the back saw to cut the housed joints, tip the saw a trifle so that the edges of the joint will be undercut. This will allow a tighter joint between the top of the tread and the stringer cut and will help hold the wedge in between the bottom of the tread and the edge of the housing.

11. Chisel out the stock between the cuts. Take this stock out carefully and to a depth of about 1/4 in. Leave the remaining 1/8 in. to be taken out smoothly by the router plane.

12. Set the router plane blade to take a cut 3/8 in. deep and use it to bottom out the joint to an even depth.

13. Cut the other tread housings in the same manner.

14. Mark the riser cuts by placing the riser templet with its straight edge exactly over the riser mark on the stringer. Mark along the opposite edge of the templet on the stringer.

15. Cut along these lines with the back saw. Chisel and rout out the stock the same as for the treads.

16. Finish cutting and routing for all the treads and risers including the nosings at the top of both stringers.

17. Make the top and bottom cuts of both stringers with a crosscut saw.

HOW TO ASSEMBLE THE STAIRS

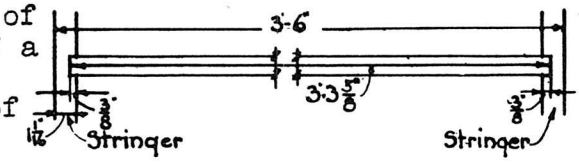
1. Select the tread stock. Use only clear stock free from imperfections and sanded to a finish on all surfaces that will show in the assembled stairs.

2. Square the pieces and cut them to length.

   NOTE: Assume that the distance between the two plastered walls of the stair well is 3 ft. 6 in.

3. Check the width of the stair well at the top and bottom and several intermediate points to see that no distance is less than 3 ft. 6 in. so that the assembled stairs will easily fit between the walls.

4. Deduct from this assumed distance of 3 ft. 6 in. twice the thickness of a stringer from the bottom of the housed joint to the outside face of the stringer (Fig. 3). From this figure subtract 1 in.



LENGTH OF TREADS

FIG. 3

   NOTE: Assuming that the stringers are 1 1/16 in. thick, the distance from the bottom of the housed joint to the outside face of the stringer would be 11/16 in. Adding 11/16 in. for the other stringer would give 22/16 in. or 1 3/8 in. 3 ft. 6 in. - 1 3/8 in. = 3 ft. 4 5/8 in. Subtracting 1 in. more would give 3 ft. 3 5/8 in., the length of the treads.

   The 1 in. is an allowance for fitting the assembled stairs in the well hole. This allowance is also made because the stairs have a tendency to spread when being assembled and the ends of all of the joints may not come up tight. The space between the stringer and wall will later be covered up with moulding.

5. Square and cut the treads and the nosed piece for the top step to length.

6. Rip the required number of wedges for both risers and treads or obtain them already cut.

7. Place the stringers on saw horses which are toenailed to the subfloor and spaced far enough apart to properly support the length of the stringers.

8. Apply glue to the housed joint in which the tread is to be inserted.

9. Insert a tread in the top housing of one stringer and tap it so the nosed section fits into the curved part of the housed joint.

10. Glue the wedge and drive it between the bottom side of the tread and the edge of the housing. Drive the tread and the wedge alternately until the tread nosing and the top surface of the tread fit perfectly against the edges of the housed joint that will show in the assembled stairs. The back edge of the tread must also be in line with the riser cut of the riser housing.

11. Drive an 8d common nail through the stringer into the nosing to pull the stringer up tightly against the tread end. Drive at least two more nails into the tread but use more if it is necessary to bring the tread up tightly against the bottom of the housed joint.

12. Insert the bottom tread in the bottom housing of the same stringer and fasten it to the stringer in the same manner.

13. Insert the opposite ends of these treads in the top and bottom housings of the opposite stringer and fasten them in the same manner.

14. Toenail the top edge of one stringer with 8d finishing nails to the tops of both saw horses. Be sure the stringer is straight. Place the steel square between the back edge of the top tread and the surface of the stringer. Bring the stairs into a square position at this point and toenail the loose stringer to the saw horses. Check the diagonally opposite corners of the stairs for squareness. Fig. 4 shows the position of the stringers on the horses during assembly.

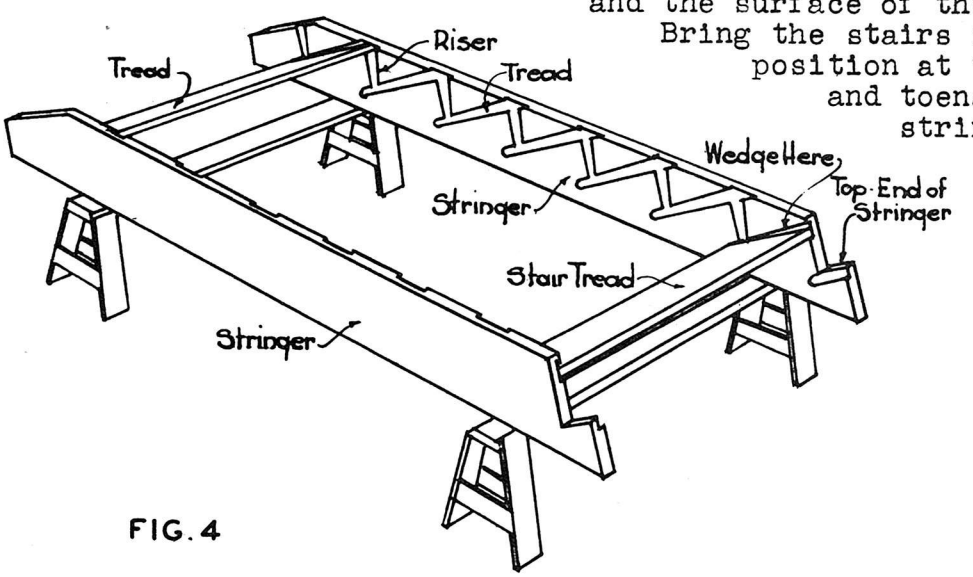


FIG. 4

PARTLY ASSEMBLED STAIRS

15. Insert the remaining treads and fasten them into the housings in the same manner.

    NOTE: Be sure the back edge of each tread is perfectly flush with the front cut of each riser housing. If it does not reach this point, chisel off the riser cut until it is even with the back edge of the tread. If the tread projects beyond this point, plane or chisel off the back edge of the tread very carefully to a straight line.

16. Cut the risers to the same length as the treads. The top riser will be about 1 3/8 in. longer than the rest as it must be face nailed to the stringers at the top cut.

17. Nail the top riser to the stringers and to the back edge of the top tread. Be sure the top of this riser is even with the bottom of the housed joint of the nosing.

18. Rip the bottom riser to width and insert it into the bottom riser housings in the same general manner as the treads.

19. Install the remaining risers and fasten them the same as the treads.

20. Nail the back of the risers to the back edges of the treads with 8d common nails. Space the nails about 8 in. apart.

21. Cut angle blocks from a 2 x 4 and glue and nail them in place with shingle nails. Put one block in the middle of the stair width at the intersection of the back surface of each riser and tread. See Fig. 5.

22. Loosen the stringers from the horses, turn the stairs over and fit mouldings underneath the nosing. Nail them to both the riser and tread surfaces with 1 1/4 in. brads.

23. Nail through the top surfaces of the treads into the risers with 8d finishing nails. Space the nails about 8 in. apart and set these nails.

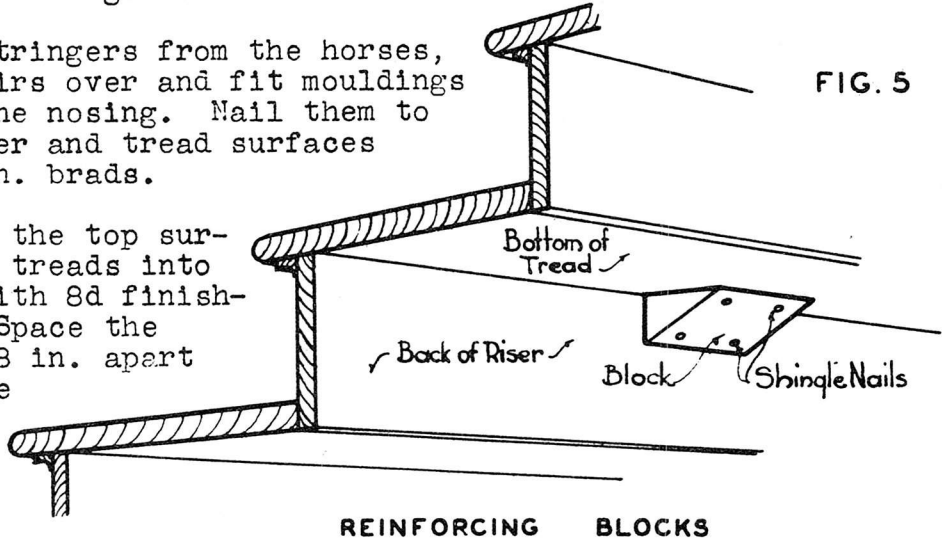


FIG. 5

REINFORCING BLOCKS

HOW TO PLACE THE STAIRS IN THE WELL HOLE

1. Place the stairs in the well hole with the top riser against the header. Adjust the top edge of the housed joint for the nosing so it is level with the top of the finished floor. To do this, it may be necessary to shim the back of the top riser out from the face of the header on one side of the well.

2. Center the stairs between the two side walls of the well and nail the riser securely to the header.

   NOTE: If the finish floor has not been laid, be sure to use blocks of finish floor stock under the bottom ends of the stringers.

3. Locate the studs in the side walls and nail through the stringers into them with 10d or 12d finishing nails.

4. Insert the rabbeted nosed piece into the top nosing housed joints and fur it solidly to the top of the subfloor or header over its entire length. Nail it to the header so that it will be forced tightly into the housed joints.

5. Set the nails and cover the stairs with building paper and wood cleats to protect the nosings and other surfaces.

6. Cut and fit mouldings on top of the stringers at the side walls of the well hole and under the top nosing of the stairs.

DESCRIPTION OF STAIRS WITH HOUSED AND OPEN STRINGERS

OBJECTIVES OF THE UNIT

1. To describe an open stringer.
2. To describe the layout of an open stringer.
3. To describe the fitting of risers and treads.
4. To describe the assembly of open stringers.

INTRODUCTORY INFORMATION

Staircases may be made with one or two open stringers. However, a staircase with one closed or housed stringer and one open or cut and mitered stringer will be described in this unit.

DESCRIPTION OF OPEN STRINGERS

The open stringer is laid out exactly like the cut-out stringer of Unit 1C-T78, except that the riser cuts are mitered to receive the mitered riser boards when the stairs are assembled. See Fig. 1.

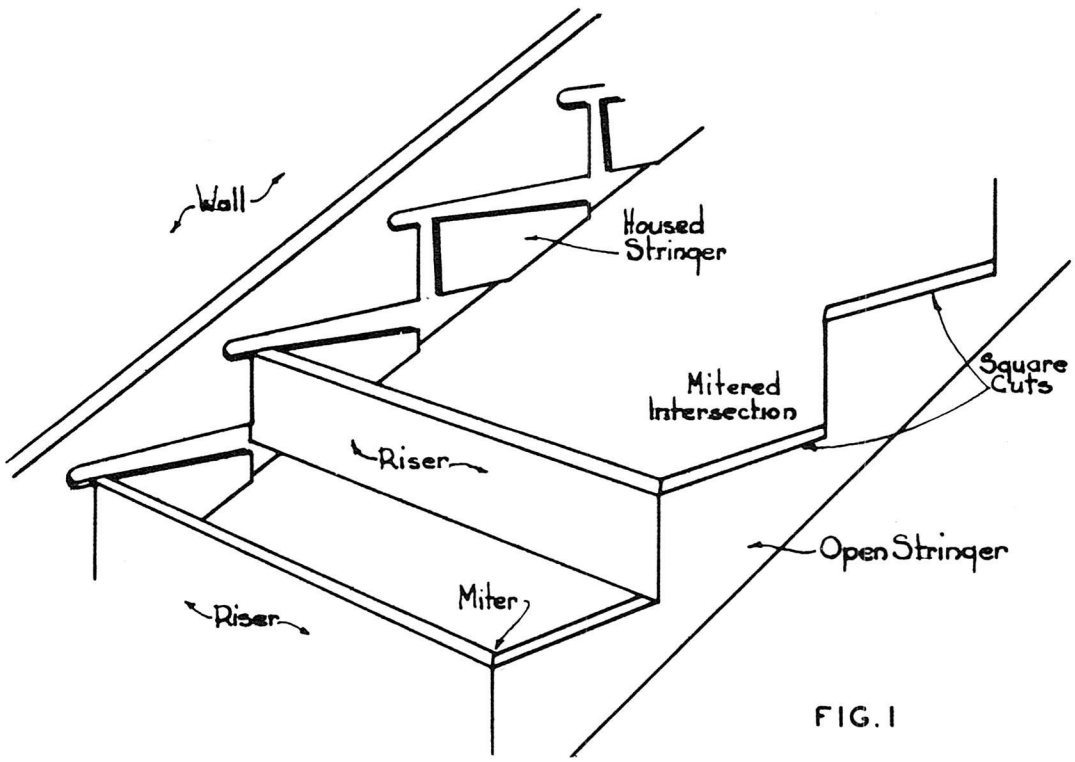


FIG. 1

CUT AND MITERED STRINGER

The tread cuts are square to receive the tread boards which extend beyond the face of the stringer and are nosed to represent a return of the tread. The tread return is sometimes formed by mitering and inserting an end piece in the tread so no end grain will show. This end piece is left loose until after the balusters have been placed in the treads. See Fig. 2. Moulding is fitted to the underside of the tread nosing the same as in the housed stringer type of stairs. These mouldings are mitered around the mitered risers and returned on the face of the open stringer underneath the return of the tread (Fig. 2).

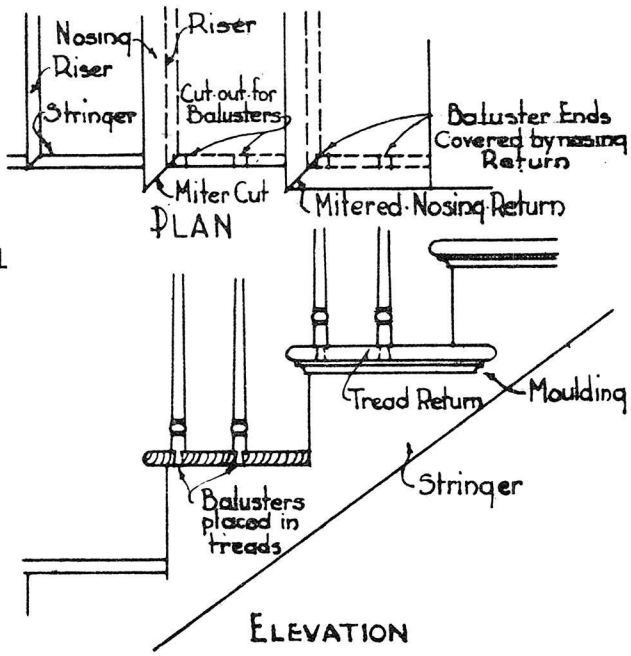


FIG. 2

TREADS RETURNED AT OPEN STRINGERS

In the assembly of the open stringer to the risers and treads, a carriage is often built on the inside of the open stringer to support the risers and treads at this side of the stairs (Fig. 3). This carriage is laid out like the carriage of the cut-out stringer type of stairs. If the staircase is more than 3 ft. wide, there should be two carriages built into the staircase to properly support the steps. The opposite ends of the treads and risers are wedged into a housed stringer as explained in Unit 1C-T79.

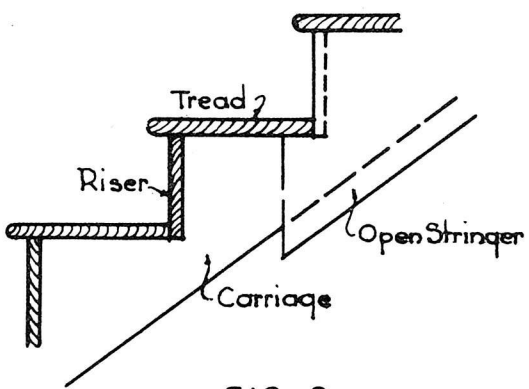


FIG. 3

CARRIAGE AT OPEN STRINGER

Newel posts, balusters and a hand rail need to be used on the open stringer type of staircase but these members will be described in a separate unit.

SELECTED REFERENCES

Audels Carpenters and Builders Guide #4 ..... Graham and Emery

Building Construction ..... Huntington

Stair Building ..... Townsend

HOW TO BUILD STAIRS WITH HOUSED AND OPEN STRINGERS

OBJECTIVES OF THE UNIT

1. To show how to cut out the open stringer.
2. To show how to cut and fit the risers.
3. To show how to cut and fit the treads.
4. To show how to assemble and brace the stairs.

INTRODUCTORY INFORMATION

The construction of the straight run type of staircase with one housed stringer along the plastered wall and one open stringer at the open side of the stairs will be described in this unit. The fundamentals involved in this type of staircase could be applied to other combinations of housed and open stringers.

TOOLS AND EQUIPMENT

Carpenter's work bench
Steel square
Brace and 1 in. Forstner or center bit
1 1/2 in. butt and 3/4 in. firmer chisel
Router plane
Marking gauge
Miter box
Coping saw
Wood wedges
Liquid glue
Hammer and mallet
Plane
Pencil
Scratch awl
Nail set
Crosscut saw, 10 pt.
Rip saw
Back saw

PROCEDURE

HOW TO CUT THE OPEN STRINGER

1. Select the material for the open stringer. This is generally 1 1/16 in. x 11 1/2 in. x the length of the stairs. Stock 25/32 in. thick is sometimes used but it is hardly strong enough, especially for stringers over 3 ft. long.
2. Lay out the open stringer in the same manner as the cut-out stringer in Unit 1C-P78.

   NOTE: Figure 1 shows how to lay out the stringer and how to miter the riser cuts.

3. Make the tread cuts of the stringer first. These cuts should be square with the face of the stringer.

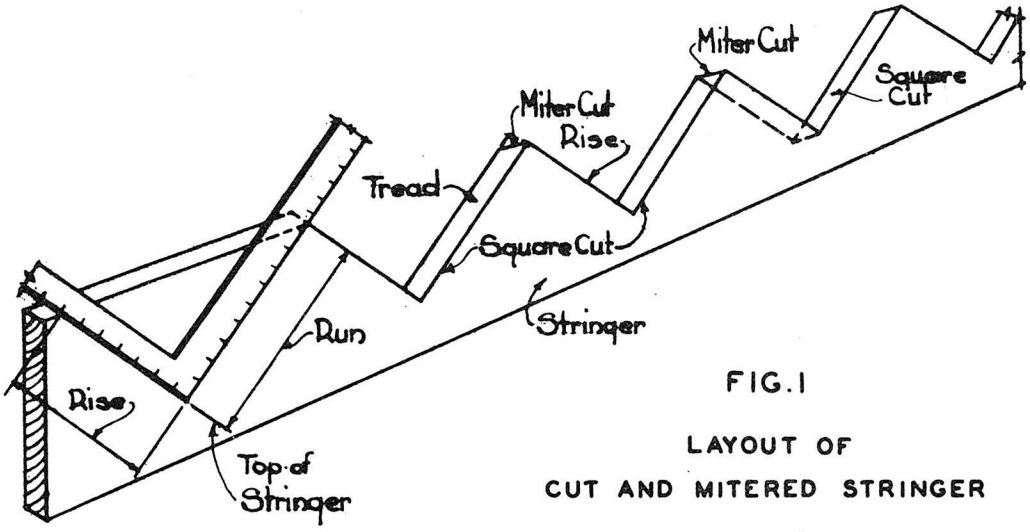


FIG. 1

LAYOUT OF
CUT AND MITERED STRINGER

4. Make the top and bottom cuts of the stringer. These cuts should also be square with the face.

5. Make the miter cuts along the riser marks. Use the riser marks as the long point of the miter.

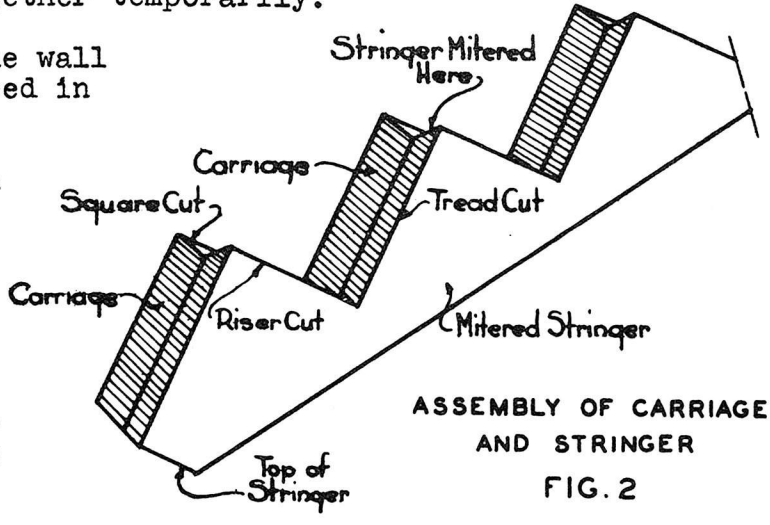
6. Lay out and cut a carriage to fit behind the mitered stringer (Fig. 2).

7. Adjust this carriage to the inside face of the stringer. Keep the tread cuts of the carriage even with the tread cuts of the stringer and the riser cuts of the carriage in line with the short ends of the miter cuts of the stringer. Nail the stringer and the carriage together temporarily.

8. Lay out and house the wall stringers as described in Unit 1C-P79.

9. Determine the length of the risers.

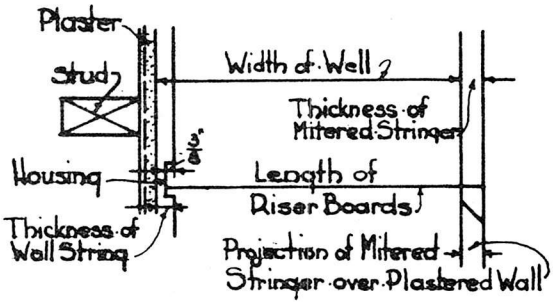
NOTE: To find the length of the risers, lay out out on the sub-floor the positions of the wall stringer and open stringer as shown in Fig. 3.



ASSEMBLY OF CARRIAGE
AND STRINGER

FIG. 2

The outside stringer usually projects about 1 in. over the outside wall of the well hole. Measure the length of the riser as shown in Fig. 3. This will give the length to the long point of the miter cut.



LENGTH OF MITERED RISERS

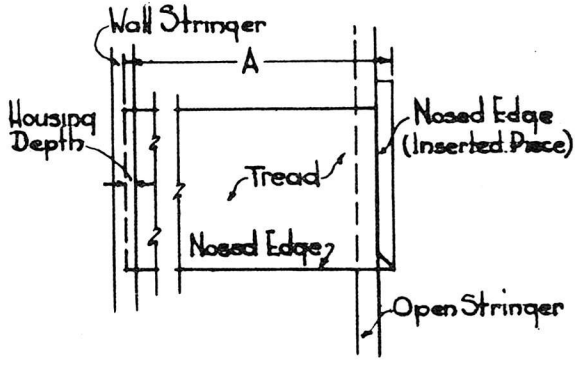
FIG. 3

10. Cut a miter on one end of each riser and cut the opposite end square.

NOTE: Generally the top and bottom tread boards are assembled in the housings first and the stair frame is then fastened to the saw horses and squared as in assembling the housed stairs. The treads and risers may also be installed into the housed stringer first and then the open stringer assembled to the opposite ends of the treads and risers. This procedure sometimes makes it difficult to square the stairs and should be avoided, especially in long stairs. In short stairs it is satisfactory.

11. Place the square ends of the risers into the riser housings of the wall stringer. Nail, glue and wedge them as in the housed type of stairs.

12. Assemble the mitered ends of the risers to the mitered riser cuts of the open stringer. Keep the top edges of the riser boards even with the tread cuts of the open stringer. Nail the miters with finishing nails to the stair carriage riser cuts and to the miter of the open stringer.



RETURNED TREAD

FIG. 4

13. Permanently nail the carriage to the open stringer.

14. Find the length of each tread by measuring from the bottom of the tread housing to the outside edge of the open stringer and adding on the amount the end of the tread will project over the open stringer. See A, Fig. 4. This projection should be the same distance as that of the nosing over the riser on the front of the step.

15. Lay out and make the miter and straight cuts on the ends of the treads as shown in Fig. 4.

16. Cut, glue and nail the mitered pieces to the ends of the treads.

    NOTE: If balusters are to be tenoned into the treads, leave the end pieces loose until the hand rail has been erected.

17. Insert and fasten the treads the same as in the housed type. Face nail the treads to the tread cuts of the open stringer and to the risers.

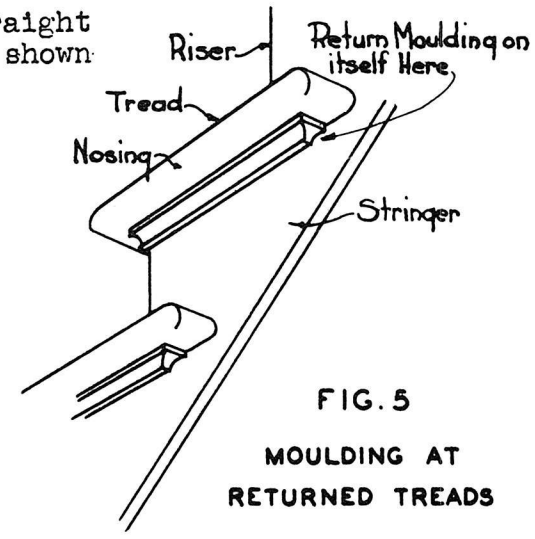


FIG. 5

MOULDING AT RETURNED TREADS

18. Cut, fit and nail the moulding under the tread nosing at the face of the risers and under the return of the tread nosing at the stringer. Return the moulding on itself at the back edge of the tread. See Fig. 5.

19. Erect the stairs against the header in the same way as in the housed stairs but be sure the outside stringer is parallel to the plastered wall.

20. Nail the top of the stairs to the header and nail the wall stringer to the studs.

21. Cut and fit a moulding along the bottom edge of the open stringer where it meets the plastered wall. Nail this moulding temporarily until the newel posts have been fitted to the stairs.

DESCRIPTION OF NEWEL POSTS AND HAND RAILS

OBJECTIVES OF THE UNIT

1. To describe newel posts.
2. To describe balusters.
3. To describe hand rails.
4. To describe the method of laying out newels and hand rails.

INTRODUCTORY INFORMATION

Newel posts and hand rails are made in so many shapes and sizes that it is difficult to describe them all in this unit. However, there are basic rules for placing them on the stairs. Square solid newel posts with straight hand rails will be used in this unit to simplify the description, layout and assembly of these parts to the staircase.

DESCRIPTION OF NEWEL POSTS

Newel posts are built on to the stringer, riser and treads of stairs to form a support for the balusters and hand rails. In straight run staircases, they are generally placed at the starting step and the top step. These are called the starting and landing newels. In L shaped stairs, there is a third post at the platform. This is called a platform or angle newel. Newel posts may be of the hollow square built-up type or the turned and square solid type. They may be finished plain or capped and paneled, depending upon their size and the style of the staircase.

Figure 1 shows the different lengths of the starting and land newels. These are of the solid square type in a colonial style.

Figure 2 shows the plan and elevations of an L shaped staircase. The locations of the starting, angle and landing newels show how they are fitted to the stringers of the stairs and why the newels are of different lengths.

If the newel posts are $4\frac{1}{2}$ in. or more wide, the side of the post may be cut out to allow the

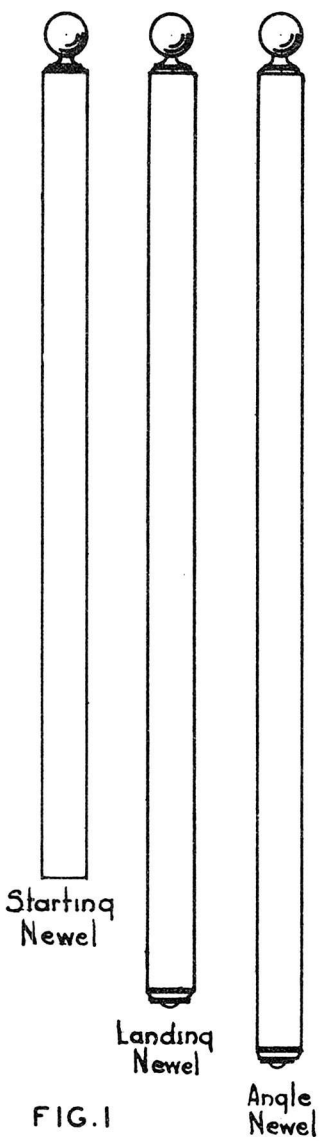
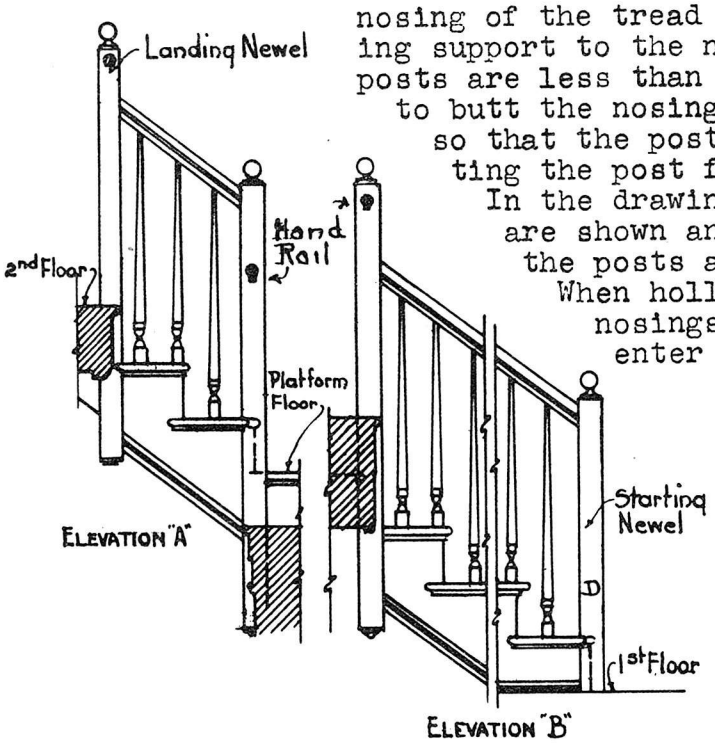


FIG. 1

NEWEL POSTS



nosing of the tread to enter the post, thus giving support to the nosing at this point. If the posts are less than 4½ in., it may be necessary to butt the nosing against the side of the newel so that the post will not be weakened by cutting the post for the nosing of the tread. In the drawings of this unit, narrow newels are shown and the nosings are butted to the posts as shown by dotted lines. When hollow square posts are used the nosings are generally allowed to enter the post.

LAYOUT OF STARTING NEWEL

It is assumed that the stairs are installed in their proper position in the well hole. Figure 3 shows the plan of the starting newel and how it is placed in relation to the outside stringer and the first tread and riser. In locating the exact position

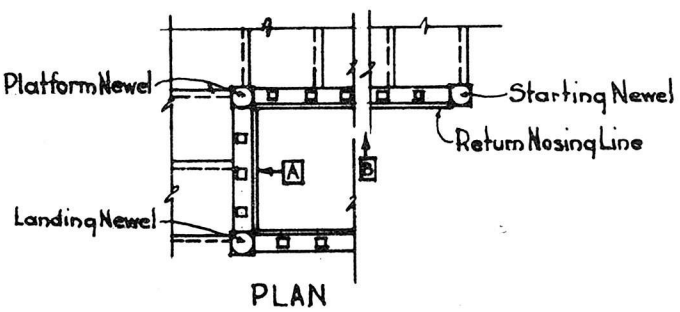


FIG. 2

STAIRS AND HAND RAIL

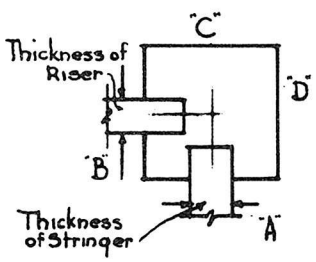


FIG. 3

STARTING NEWEL DIAGRAM

of this newel on the stringer and tread a center line must be drawn on the surface of the newel which is to be fitted to the stringer. See side A, Fig. 4. This center line must line up with the center line of the thickness of the stringer (Fig. 3). Another center line should line up with center line of the riser B, Fig. 3.

Figure 4 shows an elevation of how the surfaces A and B of the newel post are laid out to fit the stringer, tread and riser. The surface A in the plan of Fig. 3 represents the surface A in the elevation of Fig. 4. The sections marked X show the material to be

cut out of the post so the stringer will fit into the post and so the post will rest on the top of the first tread. The sides of the post opposite sides A and B will not have to be cut out as they will face the front and the outside of the staircase and extend to the floor. See Fig. 2. The elevation B shows the surface D of the newel shown in Fig. 3 and 4. In laying out the starting newel the height of the hand rail above the tread must first be considered. This distance is from 2 ft. 6 in. to 2 ft. 8 in. from the top member of the hand rail to the tread directly below the hand rail. After this location has been laid out on the post, the bottom cut of the post is measured from it. This would be the height of one riser from top of the finish floor to the top of the tread. The cuts for the stringer, tread and riser are located from the bottom cut of the post. The depth of the cuts into the posts should be only deep enough to allow the post to be centered to the stringer and riser. When laying out the newel it is advisable to check the surfaces of the stair stringer, riser and tread to see that they are perfectly straight so that the straight lines may be used on the layout of the newel.

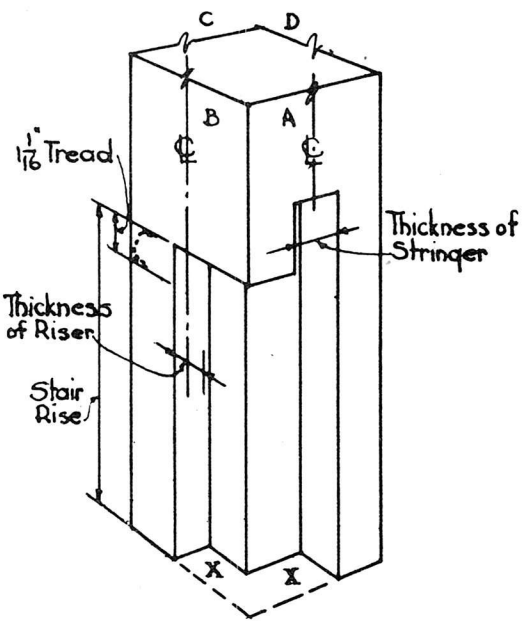


FIG. 4

LAYOUT OF STARTING NEWEL

LAYOUT OF AN ANGLE NEWEL POST

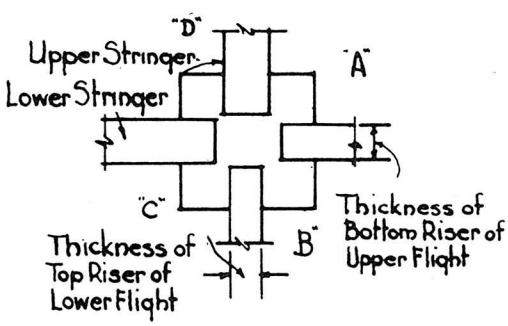


DIAGRAM OF ANGLE NEWEL

FIG. 5

The angle newel is somewhat longer than the starting or landing newel. This is to allow the hand rail of the first flight to meet the angle newel 2 ft. 6 in. above the top tread of the first flight and also to allow the hand rail of the second flight to meet the adjacent side of this newel 2 ft. 6 in. above the first tread of the second flight. See elevations A and B, Fig. 2. In other words, one rail would be the height of one riser above the other hand rail at the angle newel. The center lines of this newel should be in line with the center lines of the stringers of the upper and lower flights. Four side surfaces of this newel will have to be cut to fit the

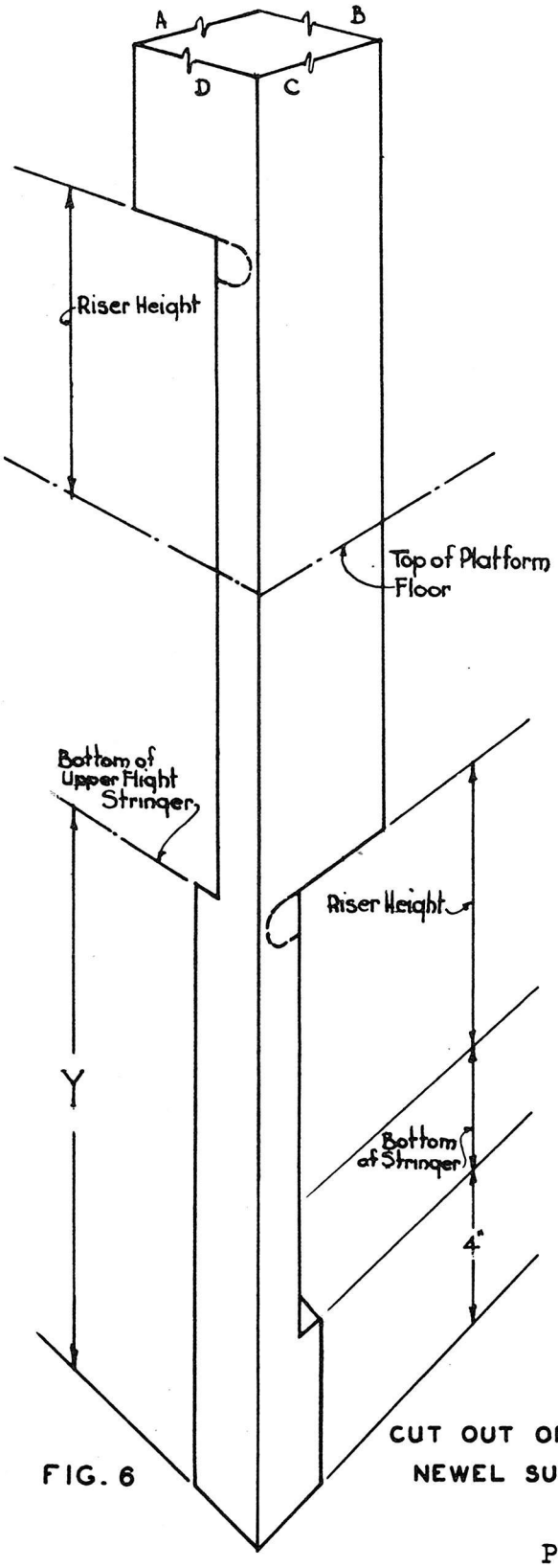


FIG. 6 CUT OUT OF ANGLE NEWEL SURFACES

surfaces of the upper and lower flights. See Fig. 2. The only tread nosings that will show on the two sides of the post that face the platform will be the top nosing of the lower flight and the bottom nosing of the upper flight. See Fig. 6.

Figure 5 shows a diagram of the angle newel and the surfaces into which the stringers of the first and second flights would enter. It also shows how the top riser of the first flight and the bottom riser of the second flight would enter the sides of this post. In order to start the layout of the surface D as shown in the diagram in Fig. 5 and in the elevation in Fig. 6, it is necessary to know how far the bottom of this newel is to be located below the bottom edge of the stringer of the first flight. See A, Fig. 7. This distance is generally about 4 in. to allow a moulding to fit on the bottom edge of the stringer and to butt against the side of the newel. See Fig. 6.

This point may be marked on the wall surface where the post is to be fitted. From this line measure the vertical distance to the top tread of the lower flight. See Y on Figs. 6 and 7. This point locates the top of the tread return shown on side C of the newel in Fig. 6. From this point measure the distance of one riser from the top tread to the platform finish floor line as shown at R, Fig. 7. This point is transferred to the side C of the post and is shown as the floor line in Fig. 6. From this point measure the height of the first riser of the upper flight and transfer this distance to the side D of the newel as shown in Fig. 6. This point locates the top of the first tread nosing return of the upper flight.

The two adjacent faces of this newel would show the tops of the platform front nosing and the tread immediately above the platform floor line. See R, Fig. 8. The center lines of the post should be kept in line with the center lines of the risers.

To lay out these sides, transfer the platform floor line of Fig. 6 to side A of Fig. 8. Locate the thickness of the bottom riser of the upper flight on the center line of side A. Also locate A, Fig. 8. Lay out for the tread of the lower flight from the platform floor line and the center line on side B. The height of the hand rail is measured from the top of the first tread of the second flight. See H, Fig. 8.

LANDING NEWEL LAYOUT

The diagram in Fig. 9 shows the second floor landing newel layout in relation to the stringer and the riser of the upper flight at the second floor line.

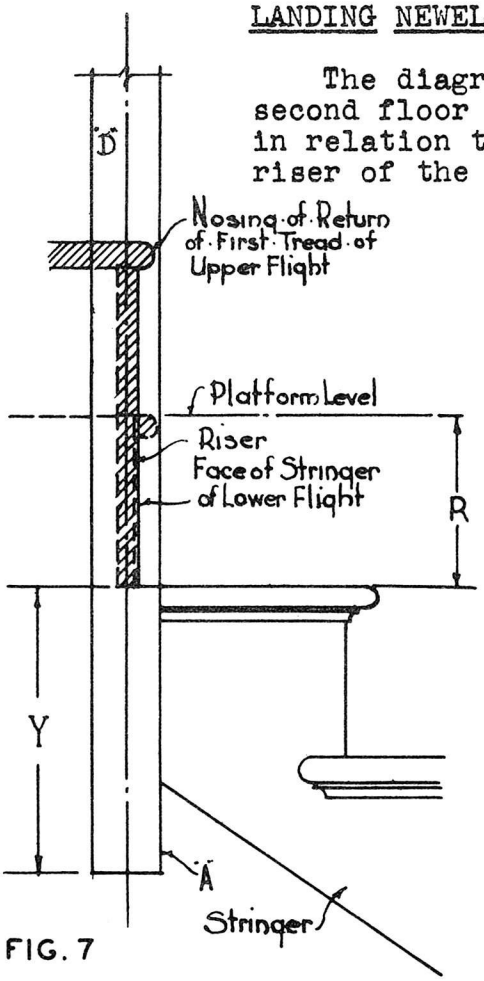
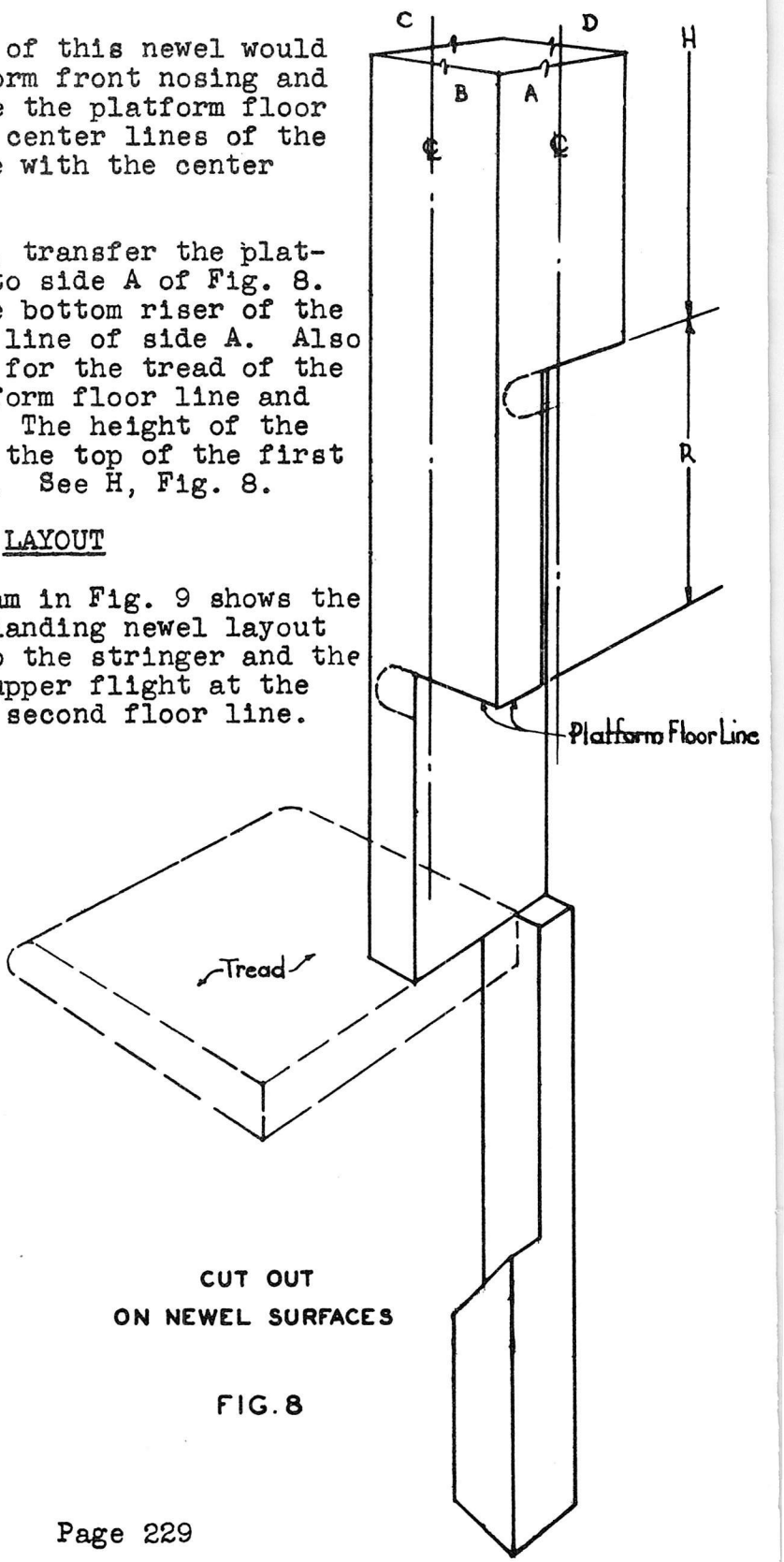


FIG. 7

ANGLE NEWEL OF PLATFORM



CUT OUT ON NEWEL SURFACES

FIG. 8

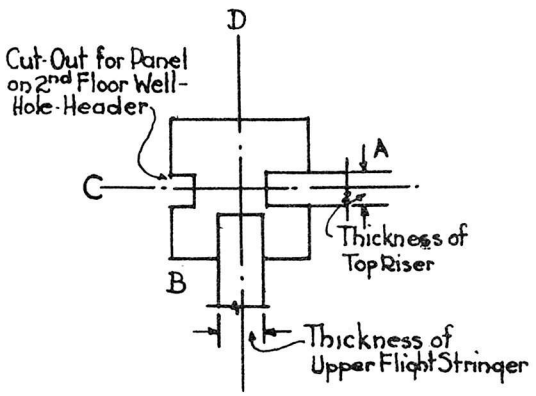


FIG. 9

LANDING NEWEL DIAGRAM

To lay out this newel, the bottom of the newel is dropped 4 in. below the bottom edge of the upper flight stringer the same as the bottom end of the newel in Fig. 6. This location is marked on the plastered wall and from this point the vertical distance to the top of the top tread in the upper flight is measured. See Fig. 10. This locates the top edge for the return nosing for this tread. The other lines on this surface are laid out for the thickness of the stringer and the fit of the newel against the plastered wall in a similar manner to side C of the angle newel in Fig. 6.

The nosing lines on the side A of the newel in Fig. 10 are laid out for the top nosing and riser of the upper flight at the second floor line exactly the same as those on the side A, Fig. 8. The opposite sides C and D are laid out as shown in Fig. 11. On the side C a panel similar in width to the stringer is applied to the plastered wall of the header of the well hole. The slanting cut shows where the newel fits to the bottom of the stringer of

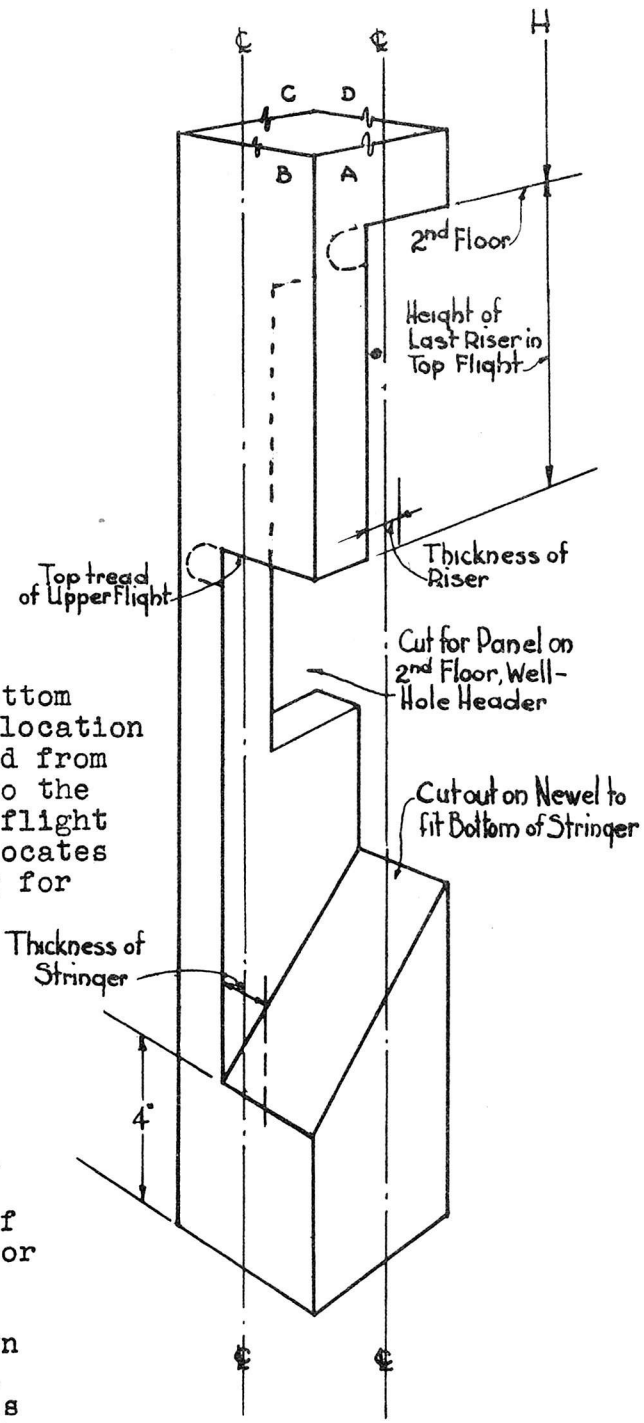
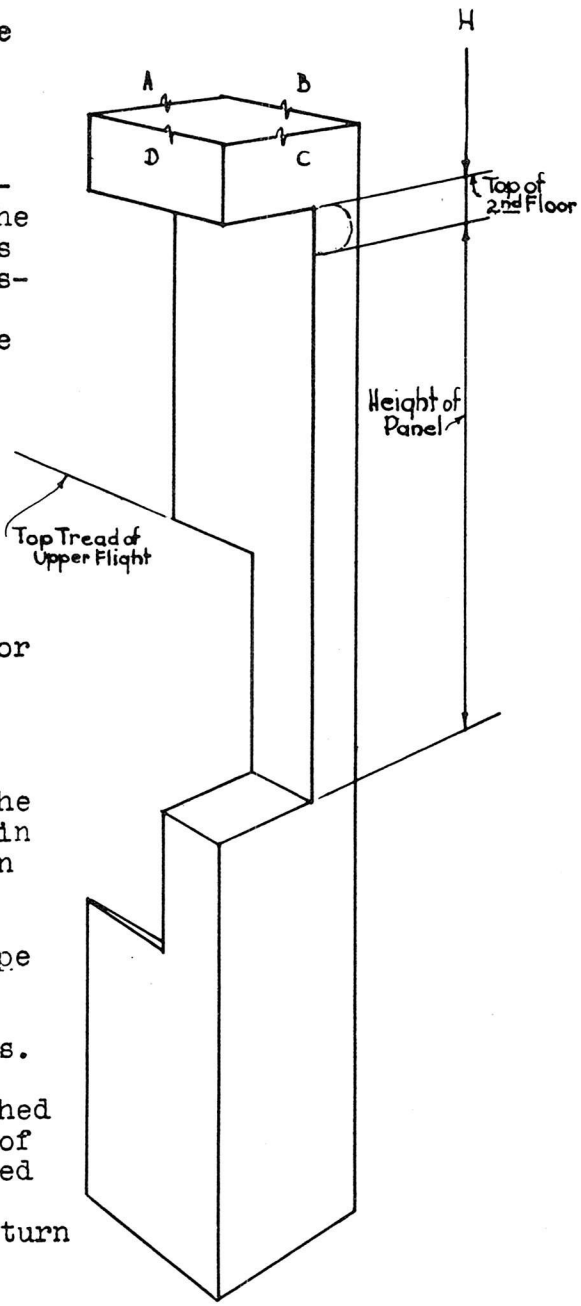


FIG. 10

LAYOUT OF LANDING NEWEL

this flight. The lines showing how the panel of the well hole fits into the newel are shown as they would be laid out on surface C.

The panel cut in the face C is similar to the cut for the stringers in the other newels. The second floor line as located on the side A, Fig. 10 is transferred to the side C of Fig. 11. The drop of 4 in. below the stringer is the same as the drop below the bottom edge of the stringer in side B, Fig. 10. The other lines on this side are also similar except that the nosing return on side C, Fig. 11 may be omitted where the edge of the second floor projects over the edge of the panel. See Fig. 2. The height of the hand rails from the top of the top tread at the second floor is shown at H, Fig. 11.

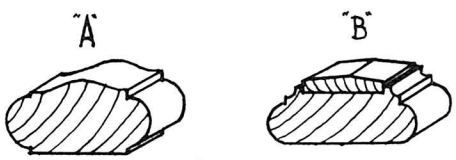


LAYOUT OF LANDING NEWEL

FIG. 11

DESCRIPTION OF HAND RAILS

A hand rail is the top member of the balustrade. For the stairs described in this unit a single member rail as shown at A, Fig. 12 is used. Rails may be obtained in many shapes and sizes from millwork companies. The two member type is shown in B, Fig. 12. The larger of these two members is ploughed out to receive the thickness of the balusters. The other member is a form of fillet which is cut and fitted into the ploughed section between the balusters. Rails of the type shown in B, Fig. 12 may be used at both the top and the bottom of the balusters on open stringers without return



HAND RAILS

FIG. 12

treads. The open stringer with return treads uses only the top rail because the bottom of the balusters are set into the tread surfaces.

In laying out the hand rail for this type of stairs, the balusters must be properly spaced. Since there are several arrangements for spacing balusters and placing the newels on the treads it is difficult to describe a definite method of spacing. However, the spacing of the balusters on the treads in relation to the faces of the risers as shown in Fig. 2 will give a general idea of baluster placement on the tread and hand rail.

Balusters are made in many shapes, sizes and lengths and may be round or square. For open stairwork, they are generally provided with a dowel on the bottom end for fitting into a hole bored in the tread. The same arrangement is provided at the top end for fitting the balusters into the hand rail.

After the centers of the balusters have been located on the treads and the underside of the hand rail, small holes are bored into the hand rail and the treads to receive the dowels on the top and bottom of the balusters. The hand rail is then fitted between the newel post and is sometimes fastened with special lag screws or it is nailed in place with finishing nails.

SELECTED REFERENCES

Stair Building ..... Townsend

Audels Carpenters and Builders Guide #4 ..... Graham and Emery

Millwork catalogs .....

HOW TO FIT NEWEL POSTS AND HAND RAILS TO STAIRS

OBJECTIVES OF THE UNIT

1. To show how to fit the starting newel.
2. To show how to fit the platform newel.
3. To show how to fit the landing newel.
4. To show how to fit hand rails and balusters.

INTRODUCTORY INFORMATION

Newel posts are sometimes made on the job in the same general manner as porch columns of the hollow type. However, the solid mill type of newel will be used in this unit as a typical style to describe the processes of cutting the surfaces to fit the stairs.

TOOLS AND EQUIPMENT

Crosscut saw, 10 pt.
Rip saw
Brace and 1 in. bit
Chisels, 3/4 and 1 1/4 in.
Mallet
Spirit level
Steel square
Rule - pencil
Try square
10 in. dividers

PROCEDURE

HOW TO FIT THE STARTING NEWEL

NOTE: It is assumed that the proper newel post is on hand and that the stairs are permanently placed for the fitting of the newels.

1. Lay out the lengths, position of the top of the hand rail, and the outlines for the stringer, nosing and riser as described for this newel in Unit 1C-T81.

NOTE: If narrow newel posts are used the cuts in the newels may be left square at the riser line and the tread nosings may be butted to the side of the post. If the size of the newels is such as to provide enough projection over the side of the stringer to allow the treads to run into the newels, cut the nosings of the treads into the newels as follows.

2. Use a brace and bit to make the cut for the nosing of the tread. The bit may also be used to start the cut for the stringer, by boring a series of overlapping holes along the layout lines on the newel.

3. Carefully chisel out the stock marked X in Fig. 4, Unit 1C-T81. Keep 1/2 in. inside the layout marks until the surplus stock has been taken out. Then carefully pare to these lines.

4. Cut out the section deep enough to allow the post to fit over the stringer and riser so that the center lines of these members line up with the center lines of the newel.

5. Square and cut the bottom edge of the post and erect it in position on the stairs. Check the fit and if it is satisfactory, temporarily nail and brace the newel plumb both ways, to the floor, tread, stringer, and riser surfaces.

HOW TO FIT THE PLATFORM OR ANGLE NEWEL

1. Lay out the newel as described in Unit 1C-T81.

2. Chisel and cut out the sections in the same general way as in cutting the sections of the starting newel.

3. Cut out the sections so that the newel, when fitted to the stairs, will center with both the stringers and risers.

   NOTE: It may be necessary to make a trial assembly of the newel to the stairs several times before it fits perfectly.

4. Cut the bottom end square or trim it as desired.

5. When the newel is properly fitted, temporarily nail it to the stair members and wall and brace it in a plumb position.

   NOTE: This newel generally has to be extensively cut. In some instances where the newel may be weakened by cutting, the return nosings of the treads might better be notched rather than to weaken the post.

HOW TO FIT THE LANDING NEWEL

   NOTE: The fitting of this newel to the stair top nosing and floor is similar to that of the landing newel except that one side is fitted around a panel board that is nailed to the face of the stairwell header at the second floor line.

1. Select a panel board 1 1/16 in. thick and approximately as wide as the stair stringer and as long as the header of the second floor between the newel and end wall of the well hole.

2. Fit this board to the plastered wall of the header. Keep the top edge in line with the bottom of the finished floor. Nail

it in this position and erect the landing newel on the stairs in the same manner as in erecting the angle newel.

3. Cut and fit the finish floor nosing, allowing it to project over the panel about 1 1/2 in. Fit a moulding underneath it and to the panel.

NOTE: If the panel is to be butted against the newel, the newel is erected first and the panel and second floor nosing fitted to the post.

NOTE: If there are more newel posts in the well hole they may be fitted and erected in the same general manner as the posts in this unit.

HOW TO FIT HAND RAILS

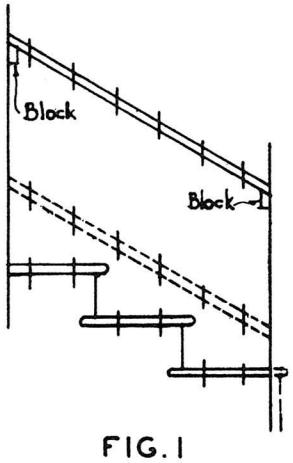


FIG. 1

SPACING BALUSTERS

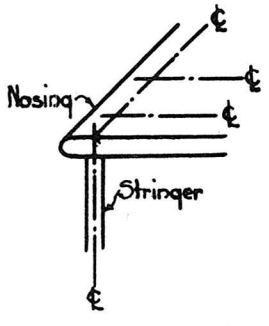
NOTE: Be sure the newel posts are plumbed both ways and are braced in this position.

1. Select the hand rail and balusters.

2. Lay the top rail along the tops of the treads and against the sides of the newel posts as shown by dotted lines in Fig. 1. Temporarily nail it in this position.

3. Space the centers of the balusters on the tread surfaces and transfer these points to the rail. Use a steel square placed on the treads to transfer these points.

4. Center the points on the width of the hand rail and also directly over the center line of the stringer on the treads. See Fig. 2.



℄ AT NOSINGS

FIG. 2

5. Bore holes to fit the dowels of the balusters at the center points on the treads and on the underside of the hand rail.

6. Tack blocks of wood to the newels to support the hand rail at the correct height from the top and bottom treads. See Fig. 1.

7. Lay the hand rail on these blocks and against the surfaces of the newel to which it is to be fitted. Mark the length of the hand rail and cut it off.

8. Fit the balusters into the treads and mark their lengths where they intersect the hand rail. Cut the balusters to length and fit them into the holes in the hand rail.

9. Make a trial assembly of the hand rail and balusters and mark the hand rail centers on the newels. Check the whole assembly for plumbness, straightness and fit.

10. Remove the top rail and glue the bottom dowels in the holes in the treads. Apply glue to the top dowels of the balusters and replace the top rail, fitting the balusters into their proper holes in the hand rail.

11. Nail or bolt the hand rail to the newels and toenail the balusters in the underside of the hand rail so that they cannot turn.

12. Nail the newel posts permanently to the stairs and fit mouldings along the underside of the open stringers.

13. Sand all rough surfaces and corners and set the nails. Cover the stairs with building paper and cleats to protect the surfaces from injury.

NOTE: In erecting the hand rail and balusters on a box stringer, the procedure is similar with the addition of a bottom member of the hand rail as shown in Fig. 12B, Unit 1C-T81. This member is nailed to the top edge of the stringer and square balusters are cut at an angle to fit into the top and bottom rail members. Fillet blocks are then fitted in between the balusters at the bottom rail. In some cases the member as shown in Fig. 12B is also used as a top rail and the balusters are fitted in the same manner as those of the bottom rail.

DESCRIPTION OF FINISHED FLOORS

OBJECTIVES OF THE UNIT

1. To describe types of finish floors.
2. To describe methods of laying finish floors.
3. To describe methods of surfacing finish floors.

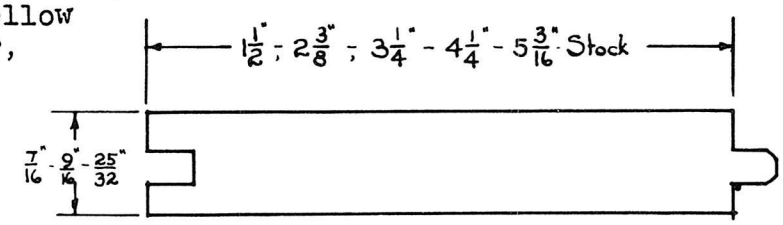
INTRODUCTORY INFORMATION

Wood floors of the tongue and groove type are often laid by the carpenter. The more decorative types, such as the parquet floor are usually laid by special contractors and will not be considered in this unit.

TYPES AND MATERIALS OF FLOORS

Finish flooring is made of any of several different kinds of woods and may be classified into two general groups.

A. The softwoods most commonly used are southern yellow pine, soft pine, fir, redwood and spruce. These woods are machined to several thicknesses and widths but the ones most commonly used for residential work are shown in Fig. 1. The edges are tongue and groove, ship lap or ploughed for spline. End matched boards have tongues and grooves on the ends so that the boards may be butted against each other when being laid and do not need to be nailed at this point. Flooring boards are sometimes machined so that the edge of the grain shows on the surface to give better wearing qualities. The backs of the wider boards are cupped out to prevent warping.



SOFTWOOD FLOORING

FIG. 1

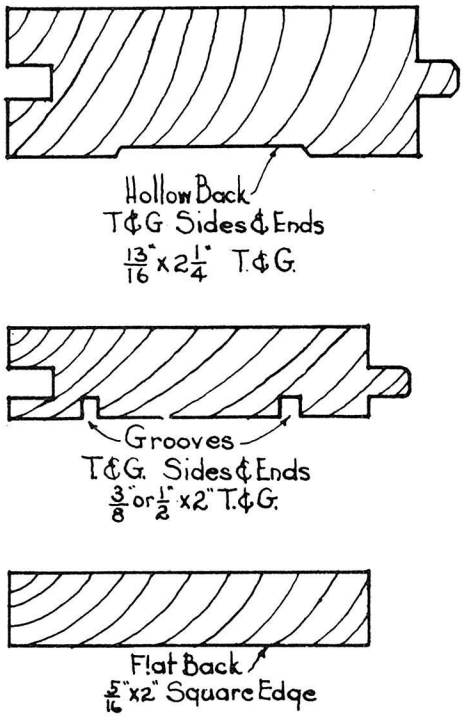
B. The hardwoods most commonly used are oak, hard maple, beech and birch. The common thicknesses, widths and end sections are shown in Fig. 2.

Flooring is obtainable in random lengths up to 18 ft. Short lengths from 14 in. up may be used when the flooring is end matched. Otherwise, pieces less than 8 ft. are considered short pieces.

METHODS OF LAYING FLOORING

The subfloor should be clean, level, free from bumps and thoroughly face nailed. A covering of heavy building paper or felt should be laid over the entire floor surface and the locations of the joists should be marked on the paper.

If the subfloor is laid diagonally, the finish floor should be laid square across the floor joists. If the subfloor is laid square across the joists, the finish floor should be laid at 90 degrees to the subfloor or parallel to the joists. When it is possible to nail the finish floor through the subfloor into the joists, a much better job is obtained than if the finish floor is nailed only to the subfloor. However, when possible, flooring should be laid with its length running in the same direction in which the most wear is likely to occur. For example, if possible, the length of the flooring boards should run into the entrance door of the room. However, the direction of the subfloor sometimes prevents this.



HARDWOOD FLOORING

FIG. 2

In many cases two types of flooring are used in the same house. There may be a maple floor in the kitchen and oak in the adjoining rooms. If this is the case, the joint between the two types of flooring should be directly under the door and the two types of flooring should be run at 90 degrees to one another.

Finish floors are laid in somewhat the same manner as other floors previously described. However, no face nailing can be done except in places that are out of sight. Hardwood flooring is generally drilled through the tongue so that the nails may be easily driven through it into the joists and subfloor. Cut nails are often used because of their holding power.

Floors are usually surfaced with an electric floor sander by floor finishers who can do the job much cheaper and better than the average carpenter.

SELECTED REFERENCES

Wood Construction ..... National Committee on Wood Utilization
Audels Carpenters and Builders Guide #4 ..... Graham and Emery

HOW TO LAY FINISH FLOORS

OBJECTIVES OF THE UNIT

1. To show how to prepare the subfloor surface.
2. To show how to lay finish tongue and groove flooring.
3. To show how to lay ship lap and splined flooring.
4. To show how to lay butterfly joint and planked or pegged floors.

INTRODUCTORY INFORMATION

The types of flooring that the carpenter generally lays will be considered in this unit. There are many other types of floors used in residential and industrial buildings but these are generally laid by mechanics other than carpenters.

TOOLS AND EQUIPMENT

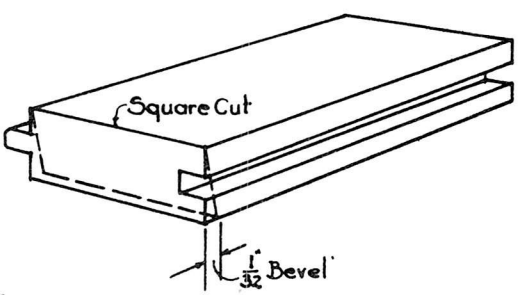
Hammer
Crosscut saw, 10 pt.
Rip saw
Pinch bar
Sliding T bevel
½ in. plug cutter
Try square
Compass saw
Dividers - scriber
Heavy 1 in. chisel
Nail set
½ in. Forstner bit

PROCEDURE

HOW TO LAY TONGUE AND GROOVE FLOORING

1. Sweep all particles from the subfloor. Inspect the surface for loose boards and imperfections. Be sure that each board is fully face nailed to the joists.
2. Lay a strip of building paper or felt on the floor where the flooring is to be started.
3. Select long pieces of flooring and cut the first course of boards to length so that they extend about 1/2 in. under the baseboards on each end.

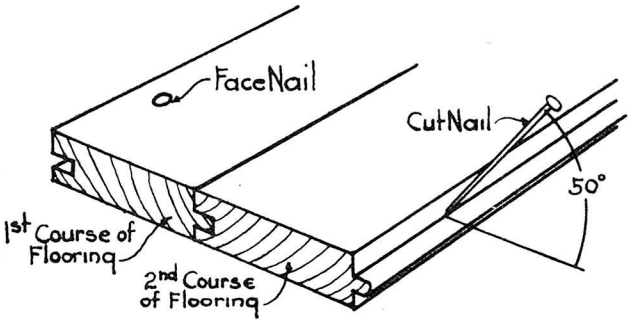
   NOTE: If it is necessary to make butt joints of the ends of the pieces, use a try square to mark the cut. Make the cut on a slant of 1/32 in. on 1 in. See Fig. 1.



FLOORING CUT
FIG. 1

HOW TO LAY FINISH FLOORS

4. Allow the groove edge of the flooring to extend under the baseboard and to butt against the ground if possible. Straighten the tongue edge and face nail the flooring near the groove so that the base shoe will later cover the nail. Space these nails about 16 in. apart and nail into joists if possible.



SLANT OF NAIL

FIG. 2

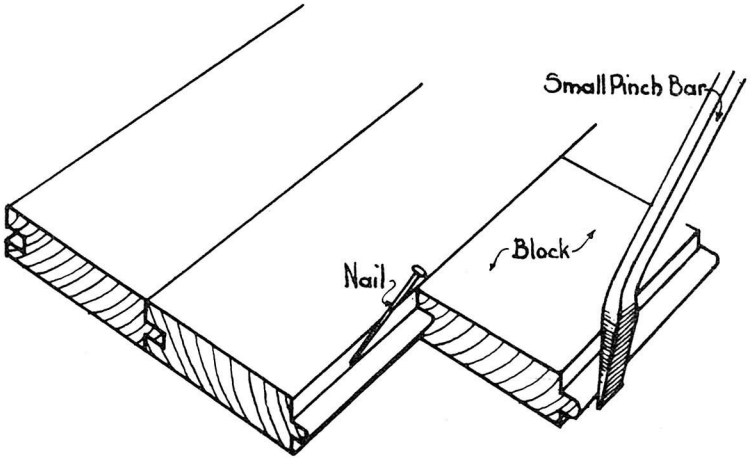
NOTE: If the room is large, use a chalked line as a guide for the first flooring strips.

5. Select pieces for the second course of flooring. Use lengths that will locate the butt joints of this course as far away from the first course joints as possible.

6. Toenail these boards as shown in Fig. 2. Use 3d finishing nails spaced 9 in. apart on 3/8 in. thick flooring, 8d cut nails on 13/16 in. flooring and 10d cut nails on 1 1/16 in. flooring.

NOTE: Generally 13/16 in. and 1 1/16 in. hardwood flooring is drilled at 16 in. intervals for nailing.

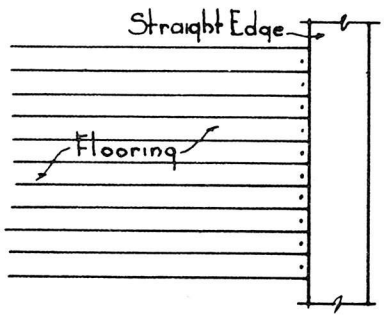
7. Use a short piece of flooring and a hammer to drive the second course of flooring up tight to the first course.



PRYING UP FLOORING

FIG. 3

NOTE: Do not depend entirely upon the toenailing to draw the boards together. Use a chisel or pinch bar and a short piece of flooring to pry the boards up tightly. When the joint is tight, drive the nail home. Be careful not to injure the top edge of the tongued flooring. See Fig. 3. Do not use the pinch bar or chisel unless



FORMING STRAIGHT BUTT JOINTS
FIG. 4

it is necessary. Use the bar with even pressure in each case. When undue pressure is necessary, there is generally something wrong besides the normal fitting of the joint, and the board should be loosened and examined to find the cause.

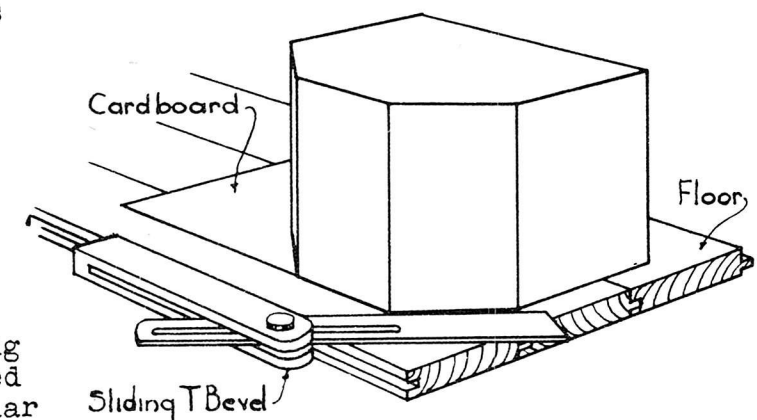
Good tongue and groove flooring is perfectly machined for a tight fit and unless the flooring has become damp, it will draw up tight. A common reason for a poor flooring job is that the carpenter may injure the tongue edge of the flooring with his hammer. This causes difficulty in drawing up the next board. If the tongue is injured, this part should be carefully cut away so as not to interfere with the next board.

8. Lay the succeeding courses of flooring in the same manner as the second course. Distribute the butt joints over the surface as evenly as possible.

9. When the opposite side of the room is reached, rip a flooring board to fit under the baseboard if necessary so that the base shoe will cover the joint between the last flooring board and the baseboard.

   NOTE: If the direction of the flooring changes at the doors or if it is to be butted against a door threshold, temporarily nail a straightedge on the subfloor so the square ends of the finish floor may be butted to it to form a straight joint at this point. See Fig. 4.

10. Face nail the butts of the flooring boards at doorways and thresholds. Plane the groove off the flooring board that is to be used against the ends of the flooring when the straightedge is removed. Face nail and toenail this board and continue laying the flooring.



IRREGULAR OPENINGS
FIG. 5

HOW TO FIT FLOORING TO IRREGULAR OPENINGS

NOTE: If the flooring is to be fitted around irregular openings such as columns, use the

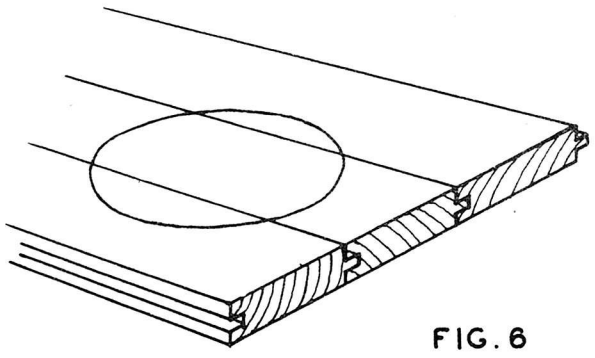


FIG. 6

CIRCULAR OPENINGS

dividers, sliding T bevel or cardboard and scribers to lay out the opening on the flooring boards. See Fig. 5.

1. Lay several pieces of flooring boards together tightly. Measure the diameter of the opening if it is circular, and outline the opening with the dividers on the several assembled floor boards. See Fig. 6.

HOW TO LAY BUTTERFLY, SPLINE JOINT AND PLANK FLOORS

NOTE: This type of flooring is sometimes used where special floor effects are desired. Special cutters may be obtained to outline and cut the butterfly and dowel openings in the flooring. These are fitted with special plugs and inlays after the boards are secured to the subfloor.

1. Cut the lengths of the flooring to fit under the baseboard in the same general manner as in cutting and laying tongue and groove flooring.

NOTE: The spline type flooring is shown at A, Fig. 7. It is fastened to the subfloor by inserting screws through the splines into the subfloor. The screw is then covered with a special butterfly inlay that is later planed flush with the top of the floor. At B is shown the same type of floor counterbored so that screws may be used and later covered with wood plugs or pegs. At C the boards are shown face nailed. The nails are set and the holes are filled.

2. Lay the first course of flooring in position, insert the spline in the grooved edge and place the second course in position. Be sure the end joints are tight and use a pinch bar or chisel to pull the boards together.

3. Nail blocks of wood on the subfloor to hold the finish floor courses tightly together.

4. Cut the butterfly opening at the joint by using a special cutter for this purpose or by using an electric router and butterfly guide.

5. Drill and countersink a hole through the spline at the bottom of the opening and fasten the flooring to the subfloor with a $1\frac{1}{4}$ in. flat head screw as shown at A.

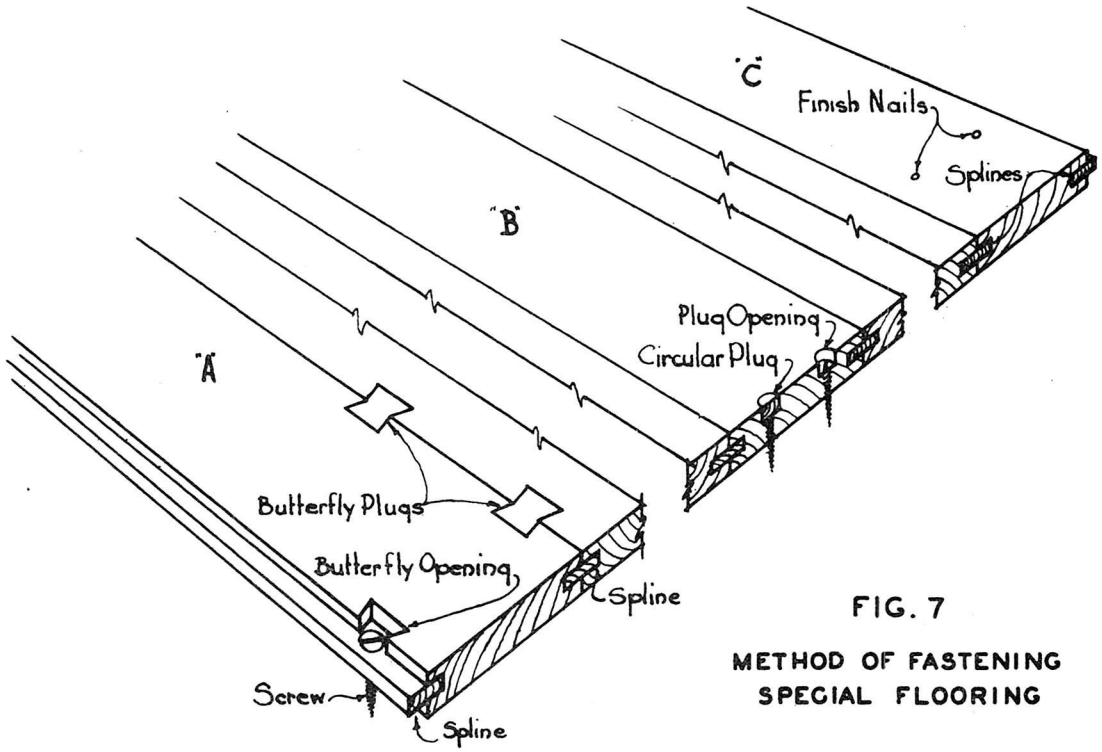


FIG. 7

METHOD OF FASTENING SPECIAL FLOORING

6. Cover the screws by gluing and inserting the inlays. Finish them flush with the surface of the floor.

   NOTE: The location of the inlays may be staggered at random over the surface of the floor so as to give a pleasing appearance.

7. Use a Forstner bit to drill the holes for the plugs as shown at B. Insert the screws and plugs in the same general manner as when fitting the butterfly inlays.

8. Facenail the flooring as shown at C. Be sure that the hammer does not injure the surface of the flooring and that the nails are long enough to go through the subfloor into the joists.

   NOTE: Finishing, casing or cut nails may be used. The finishing nail holes should be filled with filler to match the floor whereas the casing or cut nail holes should be filled with a darker filler to give a pegged effect to the floor surface.

DESCRIPTION OF INTERIOR AND EXTERIOR DOORS

OBJECTIVES OF THE UNIT

1. To describe types of doors.
2. To describe construction of doors.
3. To describe styles of door panels.
4. To describe solid and built-up doors.
5. To describe the standard sizes of doors.

INTRODUCTORY INFORMATION

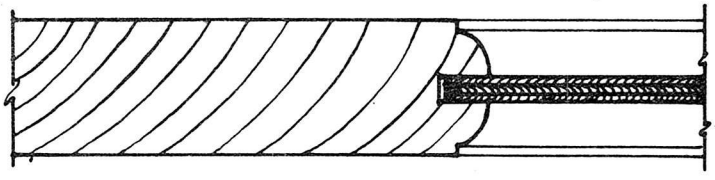
Interior and exterior doors are made in many styles and types of construction. Perhaps the best description of a particular type of door is that supplied by the mill where the door is to be obtained. However, there is an attempt being made to standardize the manufacture of doors and these standards will be described in this unit.

TYPES AND SIZES OF DOORS

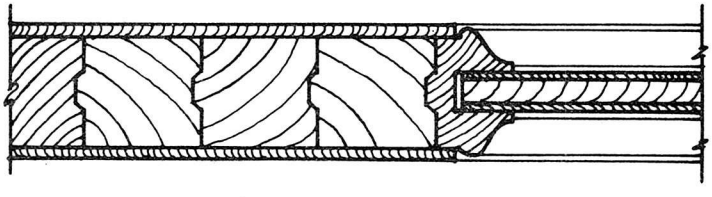
Doors are identified by their size, system of paneling and construction. The stiles are either solid or built up of several pieces of lumber machined and glued together and covered with veneer on the exposed surfaces. These stiles and rails are moulded in any one of several forms to receive the panels of the door. See Fig. 1. Figure 2 shows the cross sections of standard door panels with the exception of flush doors which are used chiefly in public buildings.

Doors are made of any one of several kinds of wood but pine and fir are most frequently used. Exterior doors are generally made of solid pine in standard paneling and glass light sizes. Veneered outside doors are made in so many styles that it is best to refer to a mill catalog for a complete description.

Figure 3 shows typical rear entrance doors and the systems of cross panels and glass lights used in this



SOLID STILE



BUILT-UP STILE

SECTIONS OF DOOR STILES AND PANELS
FIG. 1

STANDARD TYPES OF DOOR STICKING and PANELS

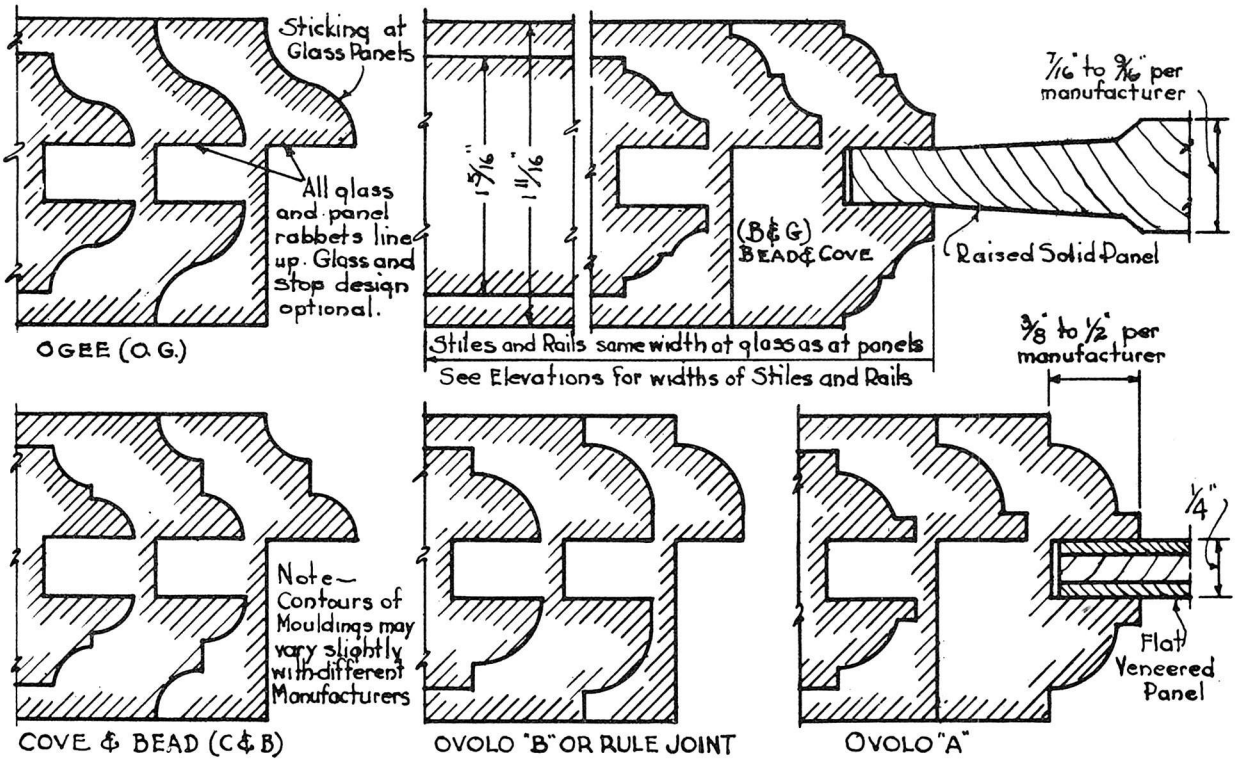
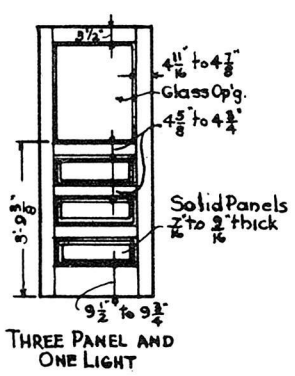


FIG. 2

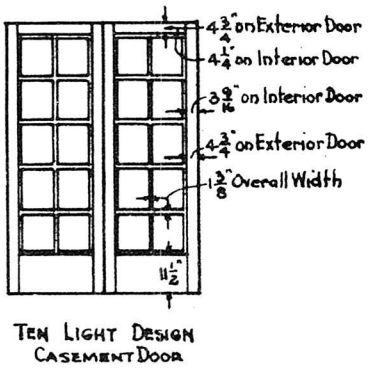
type of door. The standard thicknesses of these doors are 1 5/16 in. and 1 11/16 in. The widths and heights are as follows:

2' 6" x 6' 6"	2' 10" x 6' 10"
2' 8" x 6' 8"	2 8" x 7' 0"
3' 0" x 6' 8"	3' 0" x 7' 0"



REAR ENTRANCE DOORS

FIG. 3



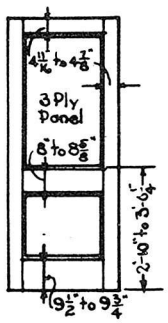
CASEMENT DOORS

FIG. 4

All glass openings in exterior doors can be divided into smaller lights. For example; an opening may be one light high and three lights wide, two lights high and two wide, two lights high and three wide or three high and three wide.

Figure 4 shows standard casement doors. They are made in thicknesses of 1 5/16 in. and 1 11/16 in. The standard sizes are made for door openings as follows:

4' 0"	opening	2' 0" x 6' 8"	or 2' 0" x 7' 0"
4' 8"	"	2' 4" x 6' 8"	or 2' 4" x 7' 0"
5' 0"	"	2' 6" x 6' 8"	or 2' 6" x 7' 0"
5' 4"	"	2' 8" x 6' 8"	or 2' 8" x 7' 0"



TWO PANEL

TWO PANEL DOOR
FIG. 5

The glass divisions of one of these doors may be as follows: two lights wide and four high, three lights wide and four high or three wide and five high.

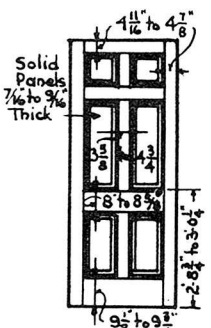
Figure 5 shows a typical two panel door. This type of door is also made in a single panel door or a six panel door such as shown in Fig. 6. The sizes of these doors are as follows:

1 3/8 in. thick

2' 0" x 6' 0"	2' 6" x 6' 8"
2' 0" x 6' 6"	2' 6" x 7' 0"
2' 0" x 6' 8"	2' 8" x 6' 8"
2' 0" x 7' 0"	2' 8" x 7' 0"
2' 4" x 6' 6"	2' 10" x 6' 10"
2' 4" x 6' 8"	3' 0" x 6' 8"
2' 6" x 6' 6"	3' 0" x 7' 0"

1 3/4 in. thick

2' 6" x 6' 6"	2' 8" x 7' 0"
2' 6" x 6' 8"	2' 10" x 6' 10"
2' 6" x 7' 0"	3' 0" x 6' 8"
2' 8" x 6' 8"	3' 0" x 7' 0"



SIX PANEL

SIX PANEL DOOR
FIG. 6

SELECTED REFERENCES

A Manual of Standard Construction for Doors, Window Frames and Sash ..... National Door Manufacturers Assoc. Inc.

Millwork catalogs .....

HOW TO FIT A DOOR

OBJECTIVES OF THE UNIT

1. To show how to make a device to hold a door.
2. To show how to fit single action doors.
3. To show how to fit double action doors.

INTRODUCTORY INFORMATION

Doors should not be delivered to the job until all the interior trim has been applied. The storage place should be dry and protected from moisture and the doors should be set upright on end. If they are left standing against a plastered wall, the door nearest the wall should be covered with building paper to protect it from moisture.

The hanging of a door will be described in the unit "How to Apply Finish Hardware".

TOOLS AND EQUIPMENT

Crosscut saw, 10 pt.
Rip saw
Jointer plane
Jack plane
Straight edge
Scriber, rule, pencil
Steel square
1½ in. chisel
Measuring rods

PROCEDURE

HOW TO BUILD A BENCH AND VISE FOR FITTING THE DOOR

1. Nail two 2 in. by 4 in. blocks about 6 in. long on a piece of stock 1/2 in. by 2 in. by 18 in. Keep the blocks as far apart as the thickness of the doors. See Fig. 1.

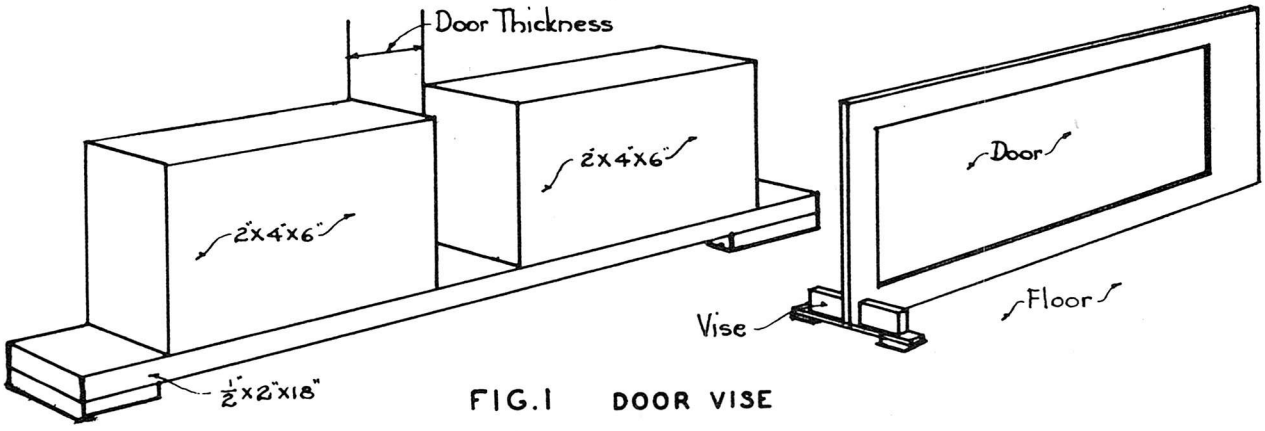


FIG.1 DOOR VISE

2. Nail this piece on the floor and place the door in an upright position in the slot between the blocks. This will hold the door so that the side rail may be planed.

   NOTE: Another way to support the door is to nail two cleats to the top of a sawhorse as shown in Fig. 2.

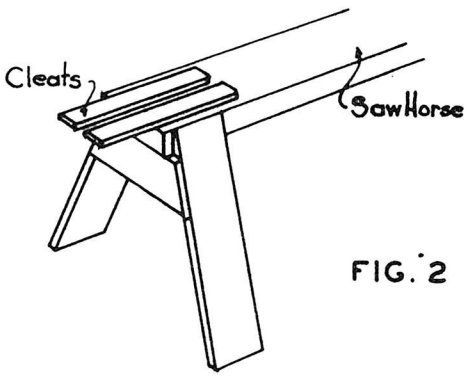


FIG. 2

DOOR VISE

3. Toenail the sawhorses and the vise to the floor. See Fig. 3.

4. Test the head jamb of the door opening with a steel square to see if it is square with the both side jambs. If it is, lay a door on the sawhorses and cut the horns off square with the stile and flush with the top of the top rail.

5. Plane the top end of the door smooth and round off the four corners about 1/8 in.

6. Make two measuring rods long enough to measure the height of the door opening. Mark the distance of the door clearance above the floor on the end of one rod. This distance is generally 3/4 in. See A and B, Fig. 3.

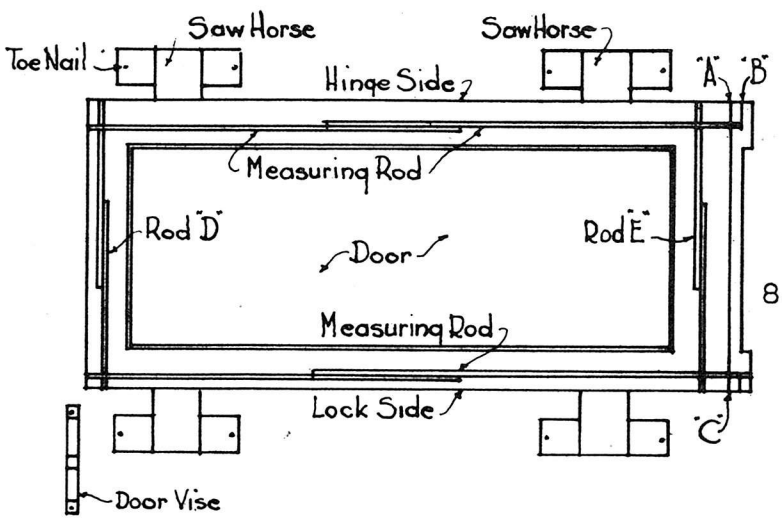


FIG. 3

FITTING A DOOR

7. Hold the two rods together and measure the height of the head jamb above the floor at the hinge side of the door opening. Keep the rod having the clearance mark on top of the floor.

8. Transfer this distance to the hinge stile of the door on the horses. Keep the section of the rod which was against the head jamb, flush with the top edge of the door and mark the clearance mark on the bottom rail of the door. See A, Fig. 3.

9. Use the rods in the same way to measure the distance from the head jamb to the floor on the lock side of the opening. Transfer this distance to the lock stile of the door and mark the clearance mark C on the bottom rail of the door.

10. Connect the marks A and C with a straight line. Use a fine crosscut saw to cut through the stiles of the door along this line and a rip saw to cut along the line on the rail. Plane the edge smooth and round the corners 1/8 in.

11. Test the side jambs with a straightedge to see if their surfaces are straight. If so, place the door on its edge in the floor vise and plane the lock stile of the door straight and square.

    NOTE: Some carpenters prefer to put a slight bevel toward the stop side of the door stile. Actually this is not necessary on 1 3/8 in. doors unless the door is less than 2 ft. wide.

12. Replace the door flat on the sawhorses.

13. Use short measuring rods to measure the distance between the side jambs at the head of the opening. Transfer this distance to the top of the door, measuring from the planed edge. Mark this distance on the hinge stile. See Rod D, Fig. 3.

14. Measure the distance between the jambs at the bottom of the door opening and transfer this distance to the bottom of the door in the same way. See Rod at E, Fig. 3.

15. Connect the two points on the top and bottom of the door with a straight line and plane the edge of the stile to this line.

    NOTE: If the door stops are not on the jambs, tack blocks to the jambs to prevent the door from going into the door opening beyond the thickness of the door.

16. Place the door in the opening and examine the fit at the head and side jambs. Plane the edges of the door to fit the contour of the face of the jambs. Allow a clearance of about 3/32 in. on the sides and head and about 3/4 in. on the bottom of the door.

17. Slightly round the edges with sandpaper and remove any marks made on the surfaces.

    NOTE: In fitting doors for double action hinges, the fitting of the door into the opening is similar to the procedure outlined above with the exception that much more clearance is required at the sides of the door. The side edges of the door would have to be rounded to allow the door to swing both ways.

DESCRIPTION OF FINISH HARDWARE

OBJECTIVES OF THE UNIT

1. To explain the materials and finishes of hardware.
2. To describe hardware for doors.
3. To describe hardware for cupboards.
4. To describe window hardware.

INTRODUCTORY INFORMATION

The proper selection and installation of hardware helps to assure the easy and convenient operation of windows, doors and cupboard doors. The modern tendency is to use hardware of simple design. Much of it is either semi-concealed or made unobtrusive by painting it the same color as the trim. The exposed parts usually have an ornamental finish which fits in with the design of the room. Although there is an extremely large number of types of hardware available, only a few examples of the most common types will be described in this unit.

MATERIALS AND FINISHES OF HARDWARE

Much hardware for both interior and exterior use is made of steel, or iron. However, this material does not present an attractive finish and will rust very rapidly when exposed to the weather. To overcome these disadvantages, it is usually given some kind of a coating or finish.

Chromium plating over steel hardware provides a rust resistant, smooth, easy to clean and attractive finish. It is used largely in kitchens and bathrooms. Cadmium plated steel hardware is very resistant to rust but it is not particularly attractive. It is frequently used in garages, cellars, for interior hardware which is not exposed, and for exteriors where appearance is not important. Steel hardware is often brass plated. While this finish is attractive, it is not rust resistant and should not be exposed to the weather. Steel hardware is frequently "prime coated", that is it is given a first coat of metal primer in the factory and is later finished with additional coats of paint on the job. Hardware made of wrought iron with a rough black finish is often used to obtain antique or rustic effects.

Any exterior steel hardware, regardless of the coatings used, may eventually rust. This will cause it to function poorly, stain the surfaces of the building, and it will eventually have to be

replaced. To overcome this trouble, much hardware is made of solid brass, bronze or other rustproof metal. Although this hardware is considerably more expensive than that made of steel with a coating of some kind, it is much more satisfactory for outside use. It may be obtained in various finishes.

Screws for exterior hardware should be rustproof. Brass screws will not rust and present an attractive appearance but they are not strong and tend to shear off if turned in with too much force. Cadmium plated steel screws are strong and rustproof. For interior work, brass plated steel screws or chromium plated steel screws are frequently used.

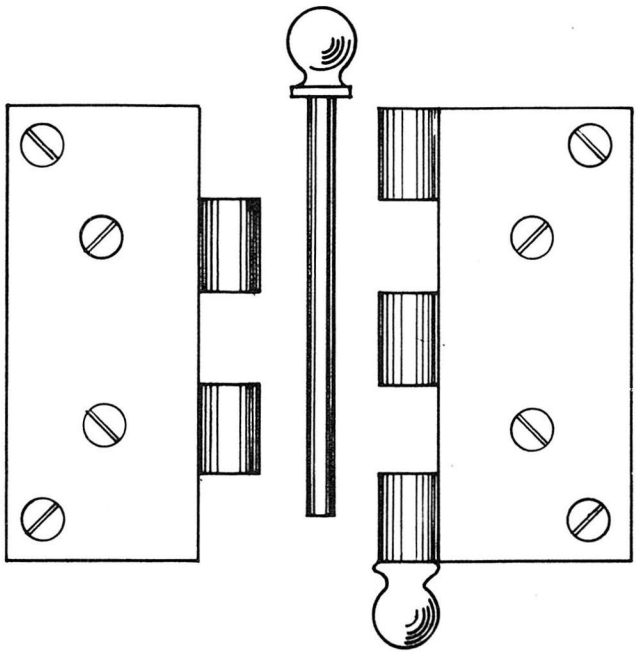


FIG. 1
BUTT HINGE

HARDWARE FOR DOORS

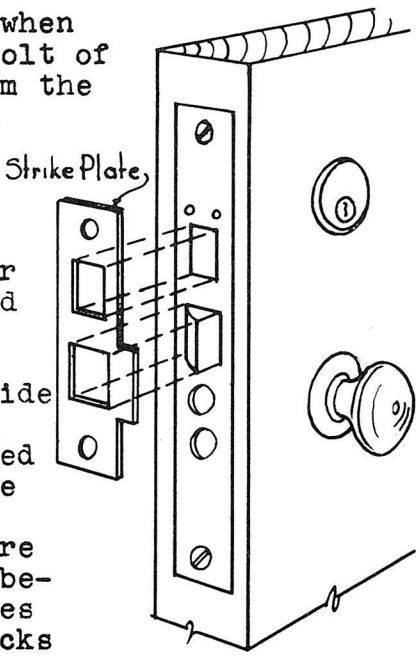
The hardware needed for an average door consists of a pair of butt hinges, a mortise lock and a door stop. Exterior doors are usually hung with three butt hinges and may have an ornamental latch on the outside.

The butt hinge shown in Fig. 1 consists of two leaves and a loose pin. Since these hinges are mortised into the door and jamb, they are slightly offset or swaged to permit the leaves to come close together. See folded hinge in Fig. 2. One leaf of each hinge is attached to the jamb and the other leaf to the door. When the door is set in its proper position, the loose pin may be placed in the hole and the two halves of the hinge will be held together. Butt hinges are made in different sizes, weights and types of bearing surfaces. However, only a few different sizes are used in ordinary frame buildings. The size is determined by the length of the leaf and the distance between the outer edges of the two leaves when the hinge is open. The length of the leaf is always stated first.

SWAGED HINGE
FIG. 2

A door lock usually consists of a latch bolt operated by either a knob or a thumb latch, and a dead bolt operated by a key. Locks are generally mortised into the edge of the door and a strike is

mortised into the jamb to receive the bolts when the door is closed. See Fig. 3. The dead bolt of an outside door lock is usually operated from the inside by a thumb knob. The dead bolt of an inside door is usually operated from either face of the door by a key. Outside doors generally have a cylinder lock for greater security while inside doors have a bit key lock. Locks applied to the surface of a door are called rim locks but they are seldom used as finish hardware.



MORTISED LOCK
FIG. 3

Flush bolts that are fastened to the inside surface of the door and to the jamb are used to hold the door closed. Chain bolts are used in a similar manner, but allow the door to be opened a few inches only unless the bolt is released. Double acting hinges are used where the door swings in either direction such as between a kitchen and dining room. These hinges are inserted in the floor or jamb. Door checks may be obtained for all types of doors. Their function is to close the door by spring action and to prevent it from slamming.

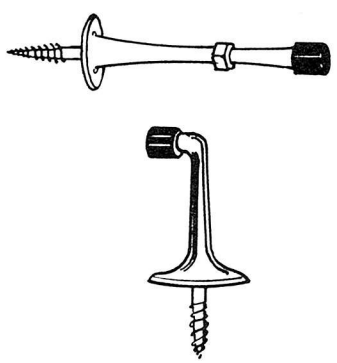


FIG. 4
DOOR STOPS

Door stops keep the door from striking the baseboard or other trim, or the door knob from striking the plastered wall. They are made of cast iron or brass and have a rubber tip. They are attached to the baseboard or floor by screwing them in place (Fig. 4).

WINDOW HARDWARE

A sash lift is usually fastened to the bottom rail of the lower sash of each double hung window to assist in raising or lowering the sash (Fig. 5). A large window may have two lifts. These are made of iron or brass and for use in a kitchen or bathroom, they are usually chromium plated.

FIG. 5
SASH LIFT

A window sash lock is used on each double hung window to hold the meeting rails together (Fig. 6). This helps to seal the joint against the weather and locks the upper and lower sash. The material and finish is usually the same as on the sash lift.

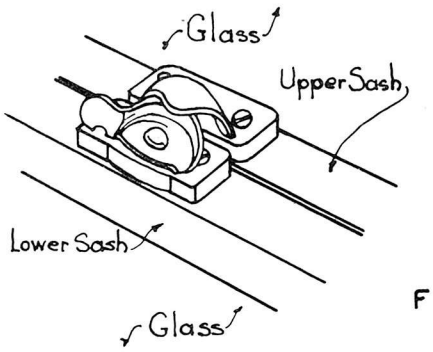
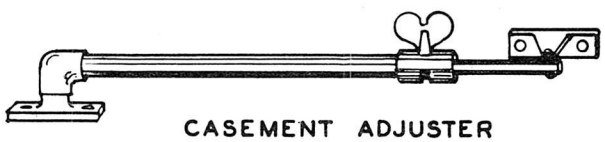


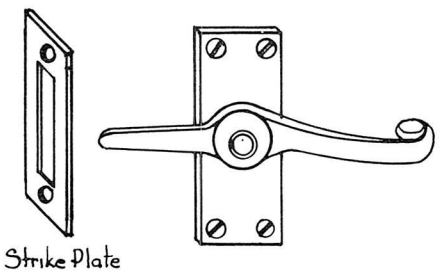
FIG. 6

SASH LOCK



CASEMENT ADJUSTER

FIG. 7



CASEMENT FASTENER

FIG. 8

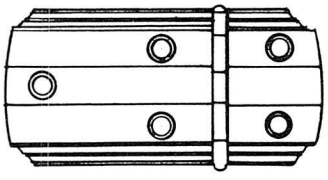
Casement windows are hinged along one edge with butt hinges. An adjuster such as shown in Fig. 7 is needed for each window. These adjusters come in several lengths and hold the window in and open position. A casement fastener (Fig. 8) locks the window.

Screens and storm windows are hung from the top window casing in such a manner that they may be easily detached when they are not needed. Screen hangers such as shown in Fig. 9 are commonly used and also serve as hinges. Storm sash may be hung from the upper parts of these hangers by applying extra lower halves of hangers to these sash in the same relative positions as on the screens.

SCREEN HANGER

FIG. 9

An ordinary cadmium plated hook is screwed into the bottom rail of each storm window and screen and an eye is screwed into the window sill. The screen or storm window may then be held firmly in place. If it is desirable to hold a storm window in various open positions for ventilation, a storm sash adjuster is frequently used. By means of a friction joint, this device will hold a storm sash in a partly opened position.

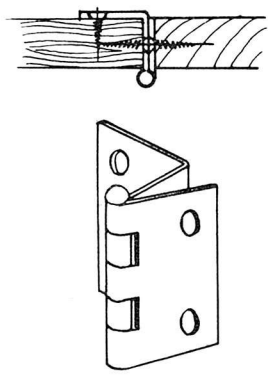


SURFACE HINGE

FIG. 10

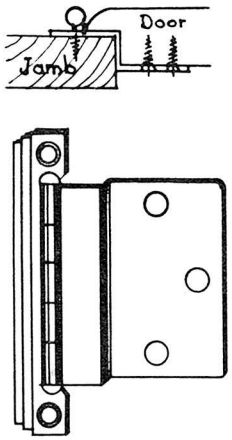
CUPBOARD HARDWARE

Cupboard doors require hinges, a handle for opening the door and a device for holding the door closed. For flush doors, small loose pin butt hinges or ornamental surface hinges (Fig. 10) may be used. If the flush door is of plywood, the butt hinge shown in Fig. 11 holds better than a regular butt hinge because



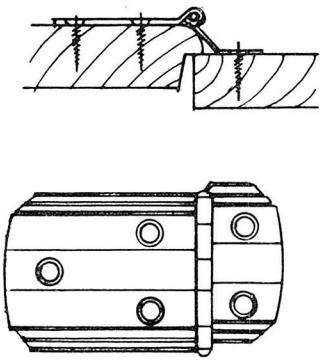
HINGE FOR FLUSH PLYWOOD DOORS

FIG.11



SEMI-CONCEALED HINGE

FIG.12



SURFACE HINGE

FIG.13

it is fastened not only to the edge but also to the back of the door. If the doors have a lip, it is necessary to use an offset hinge. This may be a semi-concealed type (Fig. 12) or a surface type (Fig. 13).

A simple pull or knob may be used to open a cupboard door. It will then be necessary to use a friction catch to hold the door closed. A common type is shown in Fig. 14. Frequently, a combination pull and catch is used on kitchen cupboard doors. Any pull placed on an upper cupboard door should be low enough to be within easy reach.

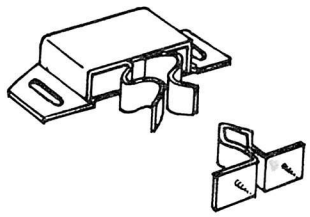
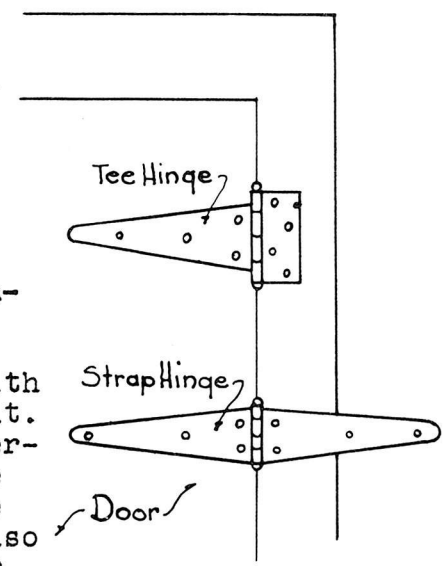


FIG. 14
FRICTION CATCH

A drawer pull or knob must be fastened to the front of each drawer. If the drawer is wide, two pulls are used.

The carpenter usually applies the garage door hardware. Swinging garage doors are generally hung with solid pin strap hinges or loose pin T hinges. See Fig. 15. The doors are generally latched and held in position with a lock, a thumb latch and a flush sliding bolt. Hardware may be obtained for all sizes of overhead doors and applied to a door built on the job. This hardware is supplied in a complete package together with instructions. It is also possible to purchase a complete overhead door with part of the hardware already applied.



GARAGE DOOR HINGE

FIG.15

SELECTED REFERENCES

Hardware catalogs .....

HOW TO APPLY FINISH HARDWARE

OBJECTIVES OF THE UNIT

1. To show the location of hardware.
2. To show how to apply door hardware.
3. To show how to apply window hardware.
4. To show how to apply cupboard hardware.
5. To show how to apply miscellaneous hardware.

INTRODUCTORY INFORMATION

Since there are so many types of hardware and methods of applying them, this unit will only describe the application in a general way. Much hardware comes in package form together with directions and templets so these directions should be carefully followed.

TOOLS AND EQUIPMENT

Brace and bits, 1/4 to 7/8 in.
Expansive bit
Keyhole saw
1/4 in., 3/4 in. firmer chisels
3/4 in., 1 1/2 in. butt chisels
Hard lead pencil - rule
Pocket knife
Scratch awl
Try square
Small and large screw drivers
6 in. flat file

PROCEDURE

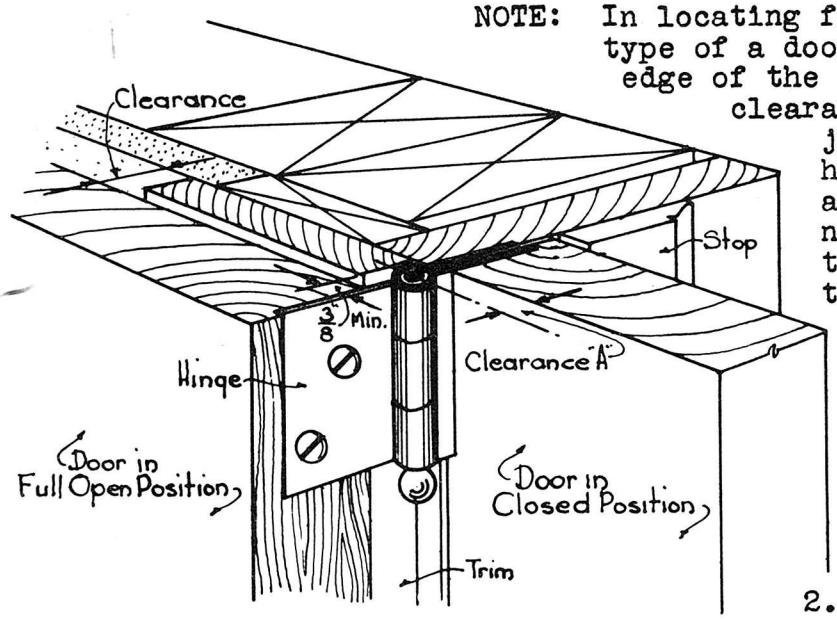
NOTE: Before hardware is applied, screwdriver bits should be selected and fitted so that they will fit the types of screws that are to be driven. Only the solid type of screwdriver should be used as the spiral automatic type often slips and injures the surfaces of the trim. If mortising machines or door butt machines are used, the wood surfaces should be thoroughly protected.

LOCATION OF HINGES ON DOORS

NOTE: It is assumed that the door is fitted to the opening to allow for swing clearance. Doors 1 3/8 in. thick or less require no bevel at the lock side for swing clearance. Doors 1 3/4 in. thick require a bevel of only 1/16 in. on this edge.

HOW TO FIT FULL BUTT HINGES FOR FLUSH DOORS

1. Select hinges large enough to clear the casings of the door trim.



CLEARANCE OF BUTTS

FIG. 1

NOTE: In locating full butt hinges on any type of a door that is flush with the edge of the jamb, there should be a clearance from the edge of the jamb to the center of the hinge pin. This clearance varies with the thickness of the door, the thickness of the trim and the size of the hinge. Clearance A, Fig. 1 shows the projection of the hinge beyond the face of the door. This clearance must be at least one half the overall thickness of the door trim.

2. Locate the position of the hinges on the jamb in reference to the height from the floor.

NOTE: Inside doors up to and including 6 ft. 8 in. high take two butts. Those from 6 ft. 8 in. to 90 in. high take three butts. If three butts are used, the middle butt should be half way between the top and bottom hinges. When two butts are used the top of the top hinge pin should be in line with the bottom edge of the top rail of the door. The bottom of the bottom hinge pin should be in line with the top edge of the bottom rail. In no case should the top hinge be less than 6 in. from the top of an 1 3/8 in. or 1 3/4 in. door. The bottom hinge should not be less than 9 in. above the floor. On 1 1/8 in. thick doors the hinges may be from 2 to 4 in. from the top and bottom, depending on the height of the door.

3. Make a gauge line on the edge of the door and on the face of the jamb at the hinge locations so the center of the hinge pin will project the correct distance beyond the face of the door. See Clearance A, Fig. 1.

4. Place the hinge on the door along the gauged line and mark the length of the hinge. Square these marks across and use a knife to cut the

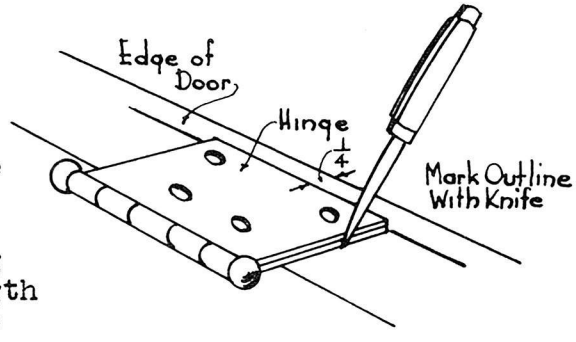


FIG. 2 LAYING OUT GAIN

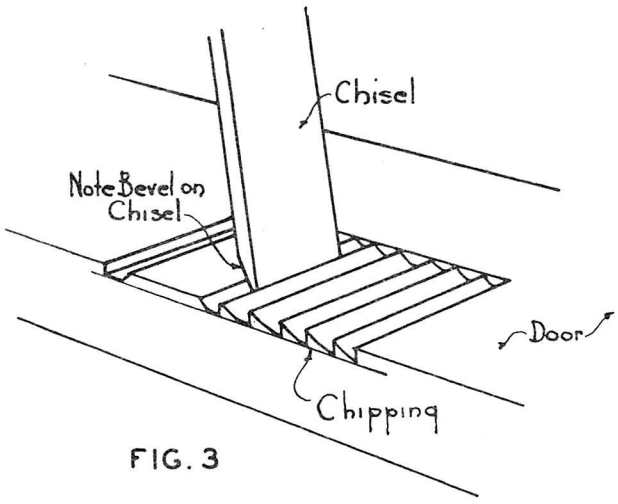


FIG. 3

CUTTING OUT GAIN

outline of the hinge about 1/16 in. deep. See Fig. 2. Follow the same procedure for the jamb.

5. Gauge the thickness of the hinge along the edge of the jamb and the face of the door. See Fig. 3.

6. Use a 1 1/2 in. butt chisel to chip out the outlined butt gain. Tap the chisel with a hammer so that the chisel will enter the wood as deep as the thickness of the butt. See Fig. 3.

7. Chip out the entire area of the gain, holding the bevel of the chisel toward the wood surface.

8. Pare the chips from the gain, holding the back of the chisel toward the bottom of the gain and paring along the gauge line which shows the depth of the gain. See Fig. 4.

9. Finish paring the bottom of the gain to the depth shown by the gauge mark on the face of the door in Fig. 3.

10. Use the chisel to cut the shoulders of the gain deeper if the chips do not pare out neatly at these points.

11. Try the hinge in the gain to see that the top surface of the hinge is flush with the edge of the door.

NOTE: This is very important as it will affect the fit of the door after it is hung. If the hinge surface is below the door surface, shim it up with cardboard until it is flush. If the hinge is above the surface, pare the gain until the butt is flush.

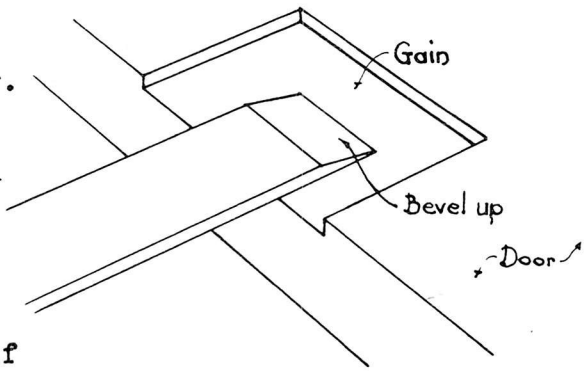


FIG. 4

PARING BUTT GAIN

12. Place the butt in the gain and if it fits perfectly, punch holes with a nail set at the screw locations. Be sure to hold the

nail set in a vertical position so that the screws will go into the wood straight and will fit flat on the butt surface. Fasten the butt with the screws.

NOTE: It is best to fit the half butts to the door in their proper locations first. Then place the door in the opening in the proper relation to the jambs and lightly wedge it in place so that the clearances are the same on the top and sides of the door. Mark the location of the hinges on the jambs.

13. Fit the opposite half of the butt to the door jamb in exactly the same manner the first half was fitted to the door.

NOTE: Be sure to use the proper half of the butt on the door and on the the jamb so that the loose pin will be inserted from the top of the hinge.

14. Fit the other door butts in exactly the same manner.

15. Hang the door on the hinges of the jamb by placing the loose pin in the top butt first. Then tap the bottom half butts together and insert the lower pin.

16. Test the door to see if it swings into the opening properly. If it does not fit well, do not force it into the opening but find the difficulty.

NOTE: Some of the most common causes and remedies of a poor fit at this point are:

(a) If the door strikes on the jamb at the lock side:-
Examine the door butts to see that the flat head screws are perfectly flat with the surface of the butt. If they are not, they may be preventing the hinge from closing properly.

Check the depth of the butt gains to see that the surfaces of the butts are not above the surface of the door or jamb. If they are, make them flush or even a little below the surface.

(b) If the door binds:-
The door butts are generally too far below the surfaces of the door or jamb and should be shimmed up.

The conditions in (a) and (b) may also be corrected by beveling the bottom of the gain in the door so

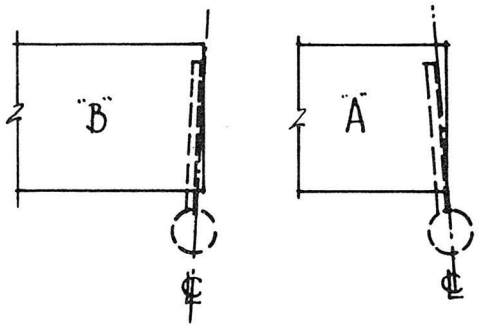


FIG. 5
SHIFTING BUTT ANGLE

the butt pin center is shifted toward or away from the lock jamb. This pulls the edge of the door toward or away from this jamb (Fig. 5).

(c) If the top or bottom of the door strikes:-
The only remedy is to plane it off. Do not try to drive the hinge butts up or down to correct this condition.

HOW TO FIT HALF SURFACE AND HALF BUTT HINGES

NOTE: These hinges are located and marked in about the same manner as full butt hinges. The butt part of the hinge should be fitted to the jamb of the door in exactly the same way as the half of the full butt hinge.

1. Screw this part of the hinge into the gains at the top and bottom of the door jamb. Assemble the surface part of the hinge to the butt part.

2. Place the door into the door opening and lightly wedge it from the surface of the floor so that it is the same distance from the top and side jambs, and so that there is enough clearance at the bottom of the door to clear rugs or floor covering. This is usually 3/4 in.

3. Mark the locations of the hinges on the surface of the door by folding the surface part of the hinge over the surface of the door and lightly punch marking the door surface through the screw openings in the hinges.

4. Fasten the surface part of the hinge to the door and test for swing clearance. If there are any errors in the hang of the door, refer to the note on the bottom of page 257 and the top of this page.

HOW TO FIT FULL SURFACE HINGES

NOTE: The full surface hinge is generally used where the casing is flush with the face of the door. In this case the hinges are located and fastened to the door and casings in about the same way as the surface part of the half surface and half butt hinge.

HOW TO APPLY MORTISE LOCKS

NOTE: If cylinder locks are used on outside doors, the center of the cylinder should be from 36 in. to 39 in. from the floor. If the cylinder is separate from the door knob and lock, it should be placed 52 in. from the floor. The centers of door knobs should be from 34 in. to 38 in. above the floor.

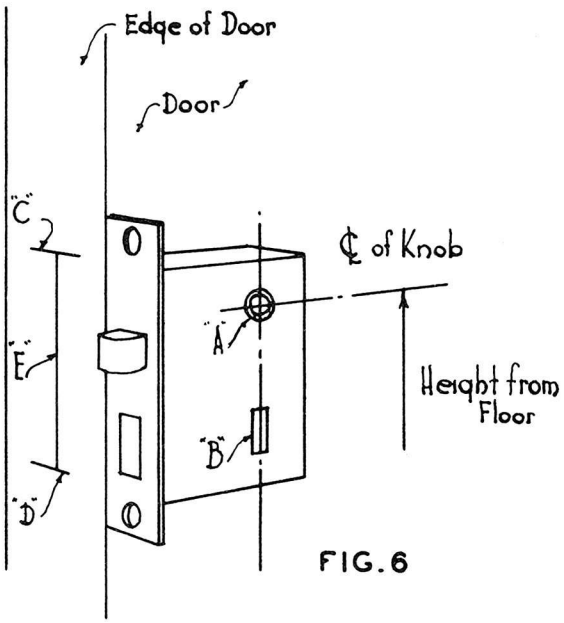


FIG. 6

LOCATION OF LOCK

1. Place the lock on the side of the door at the proper height from the floor. See Fig. 6.

2. Keep the face of the lock flush with the edge of the door and mark the door through the knob spindle hole (A, Fig. 6) and through the keyhole (B). While the lock is in this position, also mark the top and bottom of the case on the edge of the door. See C and D.

3. Mark a vertical center line on the edge of the door between the points C and D.

4. Measure the thickness of the lock case and use an auger bit about 1/4 in. larger to bore holes into the stile of the door to a depth equal to the depth of the lock. Space the holes so that they will overlap and so that the spur of the bit is on the center line. Allow the top and bottom holes to overlap the marks C and D about 1/8 in.

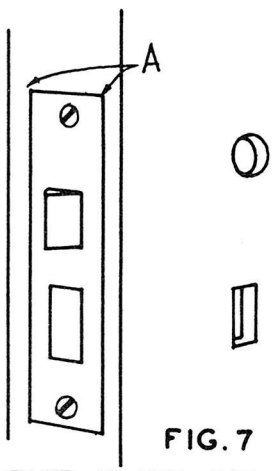


FIG. 7

FACE PLATE FIT

5. Use a 1/4 in. and a 3/4 in. chisel to clean out the holes in the door stile to form the mortise into which the lock case will fit.

6. Place the lock in the mortise so that the face plate fits against the edge of the door in a flat and straight position. Mark the outline of the face plate on the edge of the door by cutting into the wood about 1/8 in. with a knife.

7. Carefully cut out this outline to a depth equal to the thickness of the face plate.

   NOTE: Do not try to chisel out the sides of this outline shown at A, Fig. 7 or the sides of the door will split out. Use a knife for this purpose.

8. Fit the face plate flush to the edge of the door and tap it into the opening with a block of wood and a hammer.

9. Remove the lock and carefully bore the spindle hole and keyhole as marked on the side of the door. Bore from one side of the door until the point of the bit shows through and then finish the hole from the opposite side.

   NOTE: Be sure to use the smallest possible bit that will give the necessary clearance for the spindle and key.

   NOTE: If the lock is to be reversed, open the case and reverse only the latch. Be careful not to disturb the other mechanism. Replace the cover and set screw.

10. Replace the lock and be sure the spindle and keyholes are large enough to prevent the spindle and key from binding.

11. Fasten the face plate into the edge of the door.

12. Install the knob, spindle, bolt and side escutcheons. Adjust the knobs on the spindle bolt to hold the escutcheons tight to the surfaces of the door. Place washers on the spindle bolt against the escutcheon plates if they are needed. Set the knobs on the spindle bolts by tightening the set screw in the spindle.

13. Place the key in the keyhole and adjust the escutcheons so that the key is in the center of the keyhole opening. Fasten the escutcheon plates on both sides of the door in this position.

14. Test the door knobs, key and latch to see if they work freely.

15. Open the door slightly, turn the dead bolt of the lock out and mark the location of the dead bolt and the latch on the jamb edge.

16. Place the strike plate on the face plate of the lock and mark the strike vertically along the outside edge of the door.

17. Place the strike plate on the door jamb and line up the dead bolt and the latch openings of the strike plate with these markings placed on the jamb in Step 15. Also keep the vertical

mark on the strike plate in line with the edge of the door jamb. Mark the outline of the strike plate on the face of the jamb with a knife.

18. Cut out this outline in the same way as for the face plate of the lock. Mark the locations of the dead bolt and latch openings on the jamb and cut out the wood so that when the plate is fastened in place, the dead bolt and latch will enter the holes freely.

19. Test the door and lock for free working and locking. Tie the key to the knob spindle so it will not be lost.

20. Adjust the door strip stops on the head and side jambs so that the door will not rattle when closed. Nail the stops permanently and set the nails.

21. Screw a door stop into the floor or baseboard to prevent injury to the door or wall.

HOW TO APPLY WINDOW HARDWARE

NOTE: Sash locks are applied to double hung sash by lowering the upper sash so that the meeting rail rests firmly on the window sill. This supports the meeting rail while the sash lock is being fastened to it.

1. Place the catch part of the sash lock in the middle of the top sash meeting rail. Use a scratch awl to mark the locations of the screw holes in the meeting rail.

2. Fasten the lock to the meeting rail with the screws provided with the lock.

3. Raise the sash to its closed position and close the lower sash. Place the lever part of the sash lock on the meeting rail of the lower sash opposite the part on the upper sash.

4. Partly engage the two parts of the sash lock. This will locate the position of the lever on the lower sash meeting rail.

5. Mark the locations of the screws and fasten the lever to the rail. Turn the lever to the left so that it engages the catch and holds the meeting rails together.

NOTE: If the sash lock does not tighten the meeting rails, remove the lever part and move it back from the catch about 1/4 in.

NOTE: Sash lifts are mounted on the lower rail of the sash directly below the sash lock. Locate and fasten them in place with screws.

NOTE: Storm sash, screen and casement window hardware is generally fastened to the sash and window frame by placing the sash in a closed position with the proper clearance on all sides of the sash. The bottom rail may be tight against the sill.

6. Brace the sash in this position and apply the hangers, adjusters and hooks according to the manufacturer's directions.

7. Open and close the sash after applying the hardware to see that it works properly.

HOW TO APPLY CUPBOARD HARDWARE

NOTE: Cupboard hardware such as drawer pulls, friction catches and latch door handles and catches are usually accompanied by instructions and templets for their application. These instructions should be carefully followed. Butt hinges for cupboards are applied in about the same manner as the larger butts described in this unit. Surface and semi-concealed hinges are screwed to the cupboard door and casing surfaces. See Figs. 10, 11, 12 and 13, Unit 1C-T84.

BIBLIOGRAPHY

Burbank, Nelson L. Carpentry and Joinery Work. Simmons-Boardman Publishing Co., 1942.

Burbank, Nelson L. House Construction Details. Simmons-Boardman Publishing Co., 1942.

Fisher, Oscar and Meyer, L. H. Plywood Handbook. United States Plywood Co.

Field, W. B. House Planning. McGraw-Hill Book Co., 1940.

Graham, F. D. and Emery, T. J. Audels Carpenters and Builders Guide #4 Theo. Audel and Co.

Grondal, B. L. and Woodbridge, W. W. Certigrade Handbook of Red Cedar Shingles. Red Cedar Shingle Bureau, 1940.

Huntington, W. C. Building Construction. John Wiley and Sons, 1941.

Knoblock, Philip G. Good Practice in Construction. The Pencil Points Press, Inc., 1931.

National Bureau of Standards American Lumber Standards for Softwood Lumber. U. S. Government Printing Office, 1940.

National Committee on Wood Utilization Wood Construction. McGraw-Hill Book Co., 1929.

National Door Manufacturers Association
A Manual of Standard Construction for Stock Sash Doors and Frames.

Ramsey, C. G. and Sleeper, H. R. Architectural Graphic Standards. John Wiley and Sons, 1941.

Sweet's Catalog Service Sweet's Catalog File. F. W. Dodge Co.

Townsend, Gilbert Carpentry. American Technical Society, 1942.

Townsend, Gilbert Stair Building. American Technical Society, 1940.

Townsend, Gilbert and Dalzell, J. Ralph How to Plan a House. American Technical Society, 1942.

Townsend, Dalzell and McKinney How to Estimate. American Technical Society

Western Pine Association Paneling Old or New Interiors.

INDUSTRIAL-TECHNICAL PUBLICATIONS

• *Related Series for Machine Trades*

MATHEMATICS FOR BEGINNERS
ELEMENTARY BLUE PRINT READING
ADVANCED BLUE PRINT READING, Volume I
ADVANCED BLUE PRINT READING, Volume II

Teacher's Manuals and Answer Books

ELEMENTARY BLUE PRINT READING
ADVANCED BLUE PRINT READING, Vols. I and II

• *Machine Shop Series*

MEASUREMENT
BENCH WORK
DRILL PRESS WORK
LATHE WORK
MILLING MACHINE WORK
SHAPER WORK

• *Tool Design*

JIG AND FIXTURE DESIGN

• *Instrument Technology*

FUNDAMENTALS OF PRESSURE AND TEMPERATURE INSTRUMENTS
INSTRUMENTS AND PROCESS CONTROL

• *Electrical and Radio Series*

Basic Texts and Workbooks

DIRECT CURRENT FUNDAMENTALS
ALTERNATING CURRENT FUNDAMENTALS
ELECTRICAL MEASUREMENT
FUNDAMENTALS OF RADIO RECEIVERS

Advanced Reference Texts

CATHODE RAY OSCILLOGRAPH IN INDUSTRIAL ELECTRONIC CIRCUITS
ELECTRIC MOTOR CONTROL
INDUSTRIAL ELECTRONICS

• *Carpentry Series*

HAND TOOLS AND PORTABLE MACHINERY
CONCRETE FORM CONSTRUCTION
FRAMING, SHEATHING AND INSULATION
INTERIOR AND EXTERIOR TRIM
SIMPLIFIED STAIR LAYOUT

• *Sheet Metal Series*

MATHEMATICS
HAND PROCESSES
MACHINE PROCESSES
MEASUREMENT AND LAYOUT
JOB SHEET SERIES

TEACHER'S MANUAL

• *Teacher Training*

METHODS OF TEACHING INDUSTRIAL SUBJECTS—*By Gerald B. Leighbody*

• *Auto Mechanics*

GENERAL REPAIR TOOLS
BASIC REPAIR OPERATIONS
BRAKE WORK